AUG 22 1921

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ENGINEERING AND MINING JOURNAL

August 20, 1921

Shasta County has been one of California's most important mining districts for many years. This week George J. Young tells of past activities there and describes present operations at the Bully Hill property.

Engineers are human beings, after all, and appreciate stories and sidelights on their profession as told in our "By The Way" department. A snake story in this issue, to say nothing of another typical "Cousin Jack."

Mining in Argentina

By Myron R. Walker

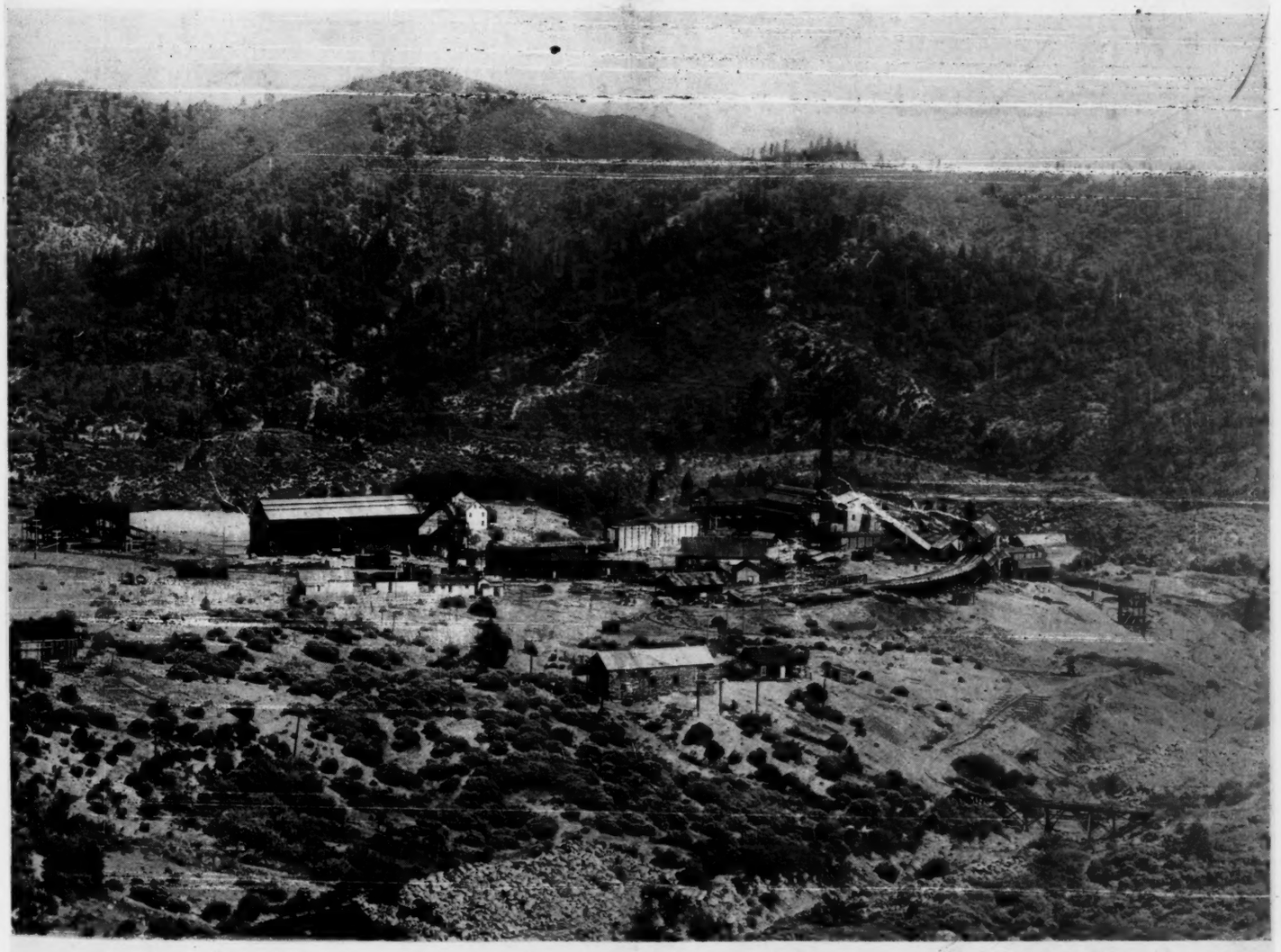
Welfare Work in the Coeur d'Alenes

By H. W. Power

Metallurgical Progress in Shasta County, Cal.

By George J. Young

New Plant of Shasta Zinc & Copper Co. at Winthrop, California



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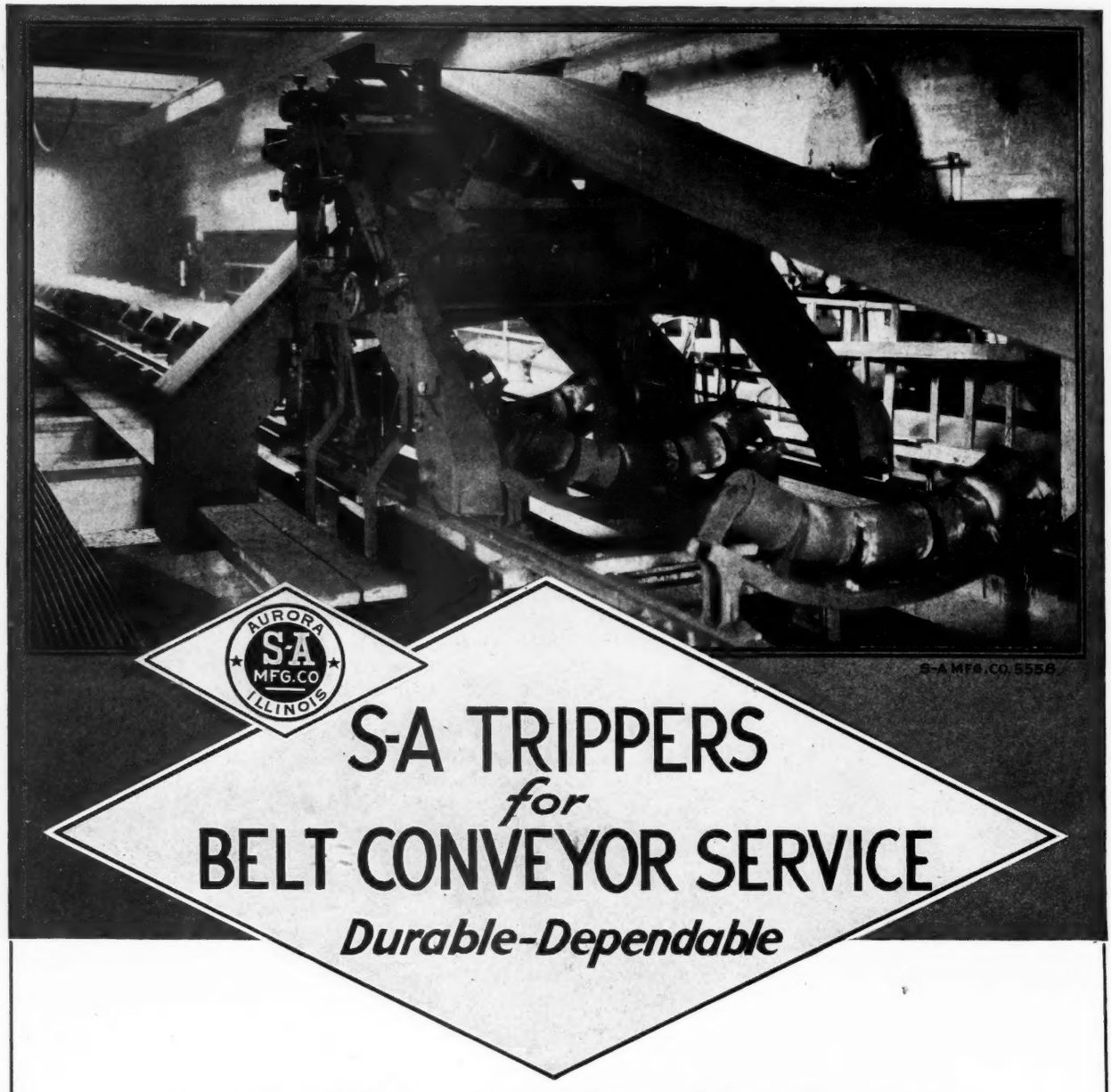

In the Mine for Ore Distribution

WITH the operation of belt conveyors it is often desired to discharge the load from the belt at certain points. The belt conveyor tripper provides this service, with the additional advantage that the tripper machine may be easily moved to any desired point along the travel of the belt. There are instances where it is desired to distribute the material over a certain range for storage purposes. The conveyor tripper accomplishes this service successfully. They are constructed to be hand-propelled or self-propelled, and can be equipped with self-reversing mechanism.

The New S-A Catalog, No. 26,
"S-A BELT CONVEYORS"

Within the pages of this catalog are described and illustrated the latest developments in belt conveyor design.

A copy should be on the chief engineer's desk.

STEPHENS-ADAMSON MFG. CO., Aurora, Ill.

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Volume 112 **New York, August 20, 1921** *Number* 8

Will the Gold Standard Survive?

EUROPEAN COUNTRIES are shipping gold to the United States with reckless abandon. Already we have more gold than any one nation ever accumulated in the history of the world, the ratio of United States to world stocks of gold being about three and one-third to eight. And the end is not in sight. The attitude of all European countries with the exception of Great Britain seems to ignore entirely the metallic basis upon which modern currency systems have been slowly and carefully built. Gold reserves, in their hands, are merely a means to an end. In an effort to save financially sinking ships they are casting overboard valuable ballast, no doubt feeling that the most important object is to reach some port that will allow them to repair the heavy damage to their vessels. As a consequence, gold reserves have been reduced to extraordinary extremes, and exported gold used to reduce enormous foreign indebtednesses or to purchase sorely needed raw materials, food, and clothing.

Financial writers have dwelt upon the tendency to get away from a metallic currency basis and have been perturbed over the prospect of a permanent abandonment of the gold standard by some countries. They point to the sorry progress all Europe has made in departing from a metallic currency, and to the substitution of paper for gold as being merely one of degree. At one end of the scale is Russia and at the other Great Britain. One of the strongest arguments advanced is that those countries which have inflated their currencies the greatest amount, Russia, Poland, Austria, Germany, and others, show little tendency or willingness to return to a gold standard. Not only are they seemingly content with the present situation but they also take pleasure in exploiting the advantages which a depreciated currency gives them in foreign trade. Indeed, the solution of the intricate problems of sound currency restoration is exceedingly difficult.

The gold standard will not be abandoned—to do so is unthinkable. The mere fact that the two most powerful nations financially, the United States and Great Britain, are still firmly wedded to it will insure its retention. The gold standard is so logical and possesses so many merits that it will win out on any count. What other basis can be used than a metallic one? Paper? What will the paper be based upon? Currency of whatever nature must have something to back it. A gold coin is valuable because of its metallic content. A gold note because it is quickly convertible into gold, and so on. Gold in ultimate analysis represents over twenty dollars of good hard work to produce an ounce, and not a few mines are unable to produce it at that level. The paper rouble or mark is mainly worth the cost of printing, which is negligible. To think that a mere governmental wave of the hand and a stamp upon a piece of paper can take the place of hard work, is preposterous.

Some adjustment will finally have to be made with the great amount of gold now in the possession of the United States. As several people have put it, we are only custodians of these heavy reserves. That is a matter which, however, does not involve the abandonment of the gold standard. Heretofore, as economists point out, the surplus accumulation of gold in a country automatically brings its own correction in its effect on price levels and international trade. There is no reason to suppose that the laws of economics will not work to help adjust the distribution of our present huge stocks of the yellow metal.

The gold standard was not adopted in a day, and in the period of its existence it has received many trials, both light and severe. From all of these it recovered, and although it is now undergoing its most trying experience, it will survive. The war shook everything, morally and physically, and there is no reason why the gold standard should have been an exception, but as the world is gradually returning to normal so will the gold standard again occupy its useful position among the nations which have seemingly abandoned it.

The Triumphs of Journalism

WE WONDER SOMETIMES why it is that the large newspapers do not find it advisable to have some one on their staffs who has an engineering training and who keeps informed concerning developments in the various engineering fields; or they might at least refer news stories on technical subjects to someone qualified to pass on them before publication. Three or four weeks ago the *New York Times*, which probably publishes more news than any other American paper, and which has a high reputation for accuracy, also, carried on the front page a long article by Cornelius Vanderbilt on the discovery of oil in the region around Fort Norman, in the Mackenzie River district of northwestern Canada. This was evidently supposed to be highly important news, and was featured accordingly. Yet it contained practically nothing which has not been known since last fall, or at least since March, when the whole matter was thoroughly discussed at the Montreal meeting of the Canadian Institute of Mining and Metallurgy. In fact, the article contained several misstatements, such as that the Imperial Oil Co. was trying to keep the Fort Norman discovery and the conditions attending the finding of the oil deposit a secret. Actually, the Imperial Oil Co. has broadmindedly given the fullest publicity to the geology of the whole region as far as it has been developed.

Of a somewhat different nature was the "news" of a process for tempering copper, which appeared in the New York papers of Tuesday, Aug. 9. In this case the *Times* was canny enough to cut the story somewhat and follow the caption with a question mark, but the *Tribune*, no less a responsible newspaper, fell for the

story to the extent of over half a column, even stating that the news had been confirmed. The denial, published in the press next day, was, of course, hard to find, being in fine print over in the back pages.

It was a good story, though. The inventor was "an oversea veteran with a wound stripe," a "war hero," according to the headline. "Bunton's discovery is one for tempering copper, an art lost since the days of the ancient Romans." (See *Engineering and Mining Journal*, May 14, 1921, pp. 813 and 826.) "He chanced one day to find a few pages torn from an old encyclopedia lying on an ash pile ready for a match. A picture caught his attention, and he picked up a few sheets. One of them contained an account of an old Roman metallurgist, incidentally a murderer of renown, who knew how to temper copper. The secret died with him. . . ."

"He will receive his money as soon as the discovery has gone the rounds of foreign patent offices. Not until then, by order of the Steel Corporation, is he at liberty to divulge the process. It is known, however, that there are three stages to the process. The first treatment of copper made it harder than copper has been made before when not alloyed, but keeps it still ductile and pliable. The second treatment makes it as hard as steel and the third so hard that it cannot be cut by the best steel saws, files, or chisels."

Then follow the names and official positions of those to whom Bunton confided his discovery, truly an impressive list, and the statement that one million dollars was to be paid by the U. S. Steel Corporation, together with 2c. royalty per pound of hardened copper to be produced. The added fact is given that Mr. Bunton is to be married in October.

Judge Gary said in denial that there was no foundation in fact for the story. At that, the Judge may have been "spoofing," if he was not ready to have the deal made public at the present time; and far be it from us to say absolutely that the story is not true.

Every so often, and it is usually in the "silly season," when the weather is hot, business is poor, and ordinary amusements pall, we are regaled with a story of the wonders of pseudo-science. These may usually be estimated by the technical man at their true worth, but for those newspapers which insist on publishing the whole truth, if there be such, we suggest that reporters be instructed to give all the details. We offer, as an example, a brief working model for release next July:

"Special Dispatch to the Press"

"Buncombe, Ill., July 1.—What is without doubt the greatest discovery of the century was revealed here last night by Henry Alva, a distant relative of Thomas A. Edison, who made known his process of manufacturing malleable or non-breakable glass, of a clarity and purity not excelled by the finest fragile fabrications of the Tiffany shops. The secret is as old as the ancients, and as little known. A company has been formed to manufacture the new product, and present glass works are already being dismantled. Some of the large milk dealers in the East have advanced two million dollars to Mr. Alva, in return for which he will confine his product to fabrication in the form of milk bottles until the demand for non-breakable bottles is satisfied."

And now comes what the papers are wont to leave out:

"The discovery was revealed before five friends of the inventor at his home at 2 o'clock this morning, after four old-fashioned glasses and a decanter had been broken. It was suggested at the time that the new product would also be useful for making poker chips. One could see by the strange look in the inventor's eyes before the discovery was announced that something unusual was about to happen.

"Prosperity comes at the critical time for Mr. Alva, who, ever since the war, has been suffering from a piece of shrapnel embedded at the base of the brain, and who will now be able to have it removed. Mr. Alva has invented numerous other things of great importance, which unfortunately are so radical that they have not yet been generally accepted."

Of course, that subject is now killed as news, but there are plenty more. We suggest for the next newspaper outburst the following: a process for artificially petrifying wood so that railroad ties, telegraph poles, and frame houses will last forever.

Strike and You're Out

THE FUTILITY of the strike as an industrial weapon has again been demonstrated at Tonopah and Divide. At a time when men elsewhere were holding on to their jobs, the employees of the mining companies there walked out on April 16, refusing to accept a wage cut of 75c. per shift that had been announced a few days before. Silver was at a dollar, and silver producers were in a better position than others, so why the cut, they reasoned. The operators contended that wages were higher in the district than elsewhere in the West, except in isolated camps; that a decline in the grade of ores being worked offset the increased price of silver; and that the cost of living had lowered appreciably. But the argument was without avail, and the spectacle of hard times in many other camps had no effect: the men walked out and, except for the stragglers that have walked back from time to time, having better sense or less money than their fellows, they have been out ever since. But now the crafts have declared the strike lost, and the miners have made haste to follow suit. Little by little before this the companies had been resuming, securing men from other districts, and it was only a question of time before operations would have again been normal.

Both sides, of course, have suffered—both the stockholders and the men. The paid union officials never lose: strikes may come and strikes may go, but their pay goes on forever. All danger of its stopping is averted at the critical point by calling off the strike. The men are out four months' wages, and it will be long before they recover their former financial position. Those who are always broke are, of course, no worse off than they were before, but the better sort are undoubtedly kicking themselves mentally around the camp for their folly of last April.

As a weapon, the strike has never gained for labor a lasting benefit that could not have been obtained by arbitration and without pecuniary loss to both sides. Strike, and both sides are out of pocket.

The Cinema and the Earth Secrets

THE MOVING PICTURE is beyond question the most powerful means of enlightening and influencing opinion, especially among the rank and file, as who should say, the masses.

Who of us who has frequented these movies—and this should include every one—but has been amused and instructed at the same time by some beautiful depiction of plant or animal life, of far-away scenes that need no lecturer to explain, of manufacturing processes which in five minutes make plain what a magazine article would not—and leaves all indelibly stamped on

the brain, as part and parcel of one's experience, not as a lesson conned with mastered attention and memorized with difficulty.

The Bureau of Mines has prepared and is exhibiting a series of excellent moving picture films showing various phases of the mining industry. This is a worthy activity, as it will instruct the public as to the real stern business of mining—a public which is otherwise instructed in mining by the movies only when the hero, having donned high boots and a flannel shirt, exposing muscular bare arms and a noble mien, sticks his pick once—or at most four or five times—into the rock, and then picks out the nugget which is worth a million.

We were not aware that the marvels of geological science had been depicted in action in the cinema. The bizarre possibility comes to us after reading an illustrated article on "How Rocks Grow," by William M. Butterfield, in *Science and Invention*. This is a brief and scientifically correct popular statement of some of the wonders of geology, which, with eight drawings, occupies altogether only a single page! Here indeed is much compressed into little. The illustrations show: (1) glacial action grinding rocks to powder; (2) an active volcano, showing the agency which has a part in forming volcanic rocks; (3) a mountain cascade playing its part in rock disintegration; (4) level strata of rock undisturbed by any changes; (5) the bending and deformation of originally parallel strata; (6) the erosion and upheaval of rocks, forming mountains and making the strata totally irregular; (7) man's mining operation, where he performs the functions of the mole; and (8) mining animal rock (coral rock) in Bermuda.

Many of the geological processes could be shown on the moving-picture screen so effectively that no student would fail to grasp the idea, nor would he fail to pass an examination upon it. It would be interesting to see if the cunning devices of the machine could not also be utilized to make geological changes more vivid for the advanced student and for the man of general culture. We are all familiar with the device whereby a bud blossoms into a flower on the screen before one's eyes, the pictures having been taken at slowly spaced intervals by an automatic timing device. Could not this be applied to geology, and thus forever do away with the popular belief in the everlasting hills?

Where an island of sand and gravel is being attacked by a marine or river current, for example, and within a day or a week or a month is totally destroyed, the cinema could show it to us, dissolved in a minute. Where, after heavy rains, a deep gorge is worn within a few days in some gravel deposit, the machine would show it cut out as by a knife cutting into cheese. It is difficult to foresee the lengths to which this demonstration could go. Doubtless it would be too much to expect that photographs could be taken of glaciers at regular intervals over a number of years, and then speeded up, showing us the ice actually in the motion of flow!

But what we look upon as impossible today is the conservative commonplace of tomorrow. Recently we were looking over a volume of Poe's prose. Now, we recall Poe as the man with the bulging forehead and the wild poetic imagination. One of his stories was staged in the year 2000 and something, and was of the type designed to forecast fantastic advances which the creator imagines may take place in a few hundred years. Poe's imagination took the line of future air travel—and, according to him, in 2000 A. D. they did travel by air. By aeroplane or dirigible? Not at all—by the plain balloon, with a basket, which he had already seen—without direction, and only voyaging in one direction or another by a knowledge of definite air currents in different air layers (which do not exist). When his balloon voyagers wished to communicate with the earth, or with one another, what did his riotous imagination suggest they would do? Wireless telegraphy, wireless telephoning, as they do nowadays—even light-flash telegraph, now antiquated? Oh, no—in the year 2000, according to Poe, they put their messages into a bottle and dropped it into the sea; and maybe somebody picked it up! It is a pity to expose the workings of a giant intellect by the cold light of subsequent checking up; like the financial agency that circularized us, boasting "we advised the purchase last week of Sox preferred at 28, and it is now 35." But the letter arrived a month late, and a glance at the newspaper showed that Sox preferred was selling at 15.

To be a prophet you have to act quickly and then turn the subject. So we shall not prophesy whether or not the next generation may watch upon the screen the formation of mineral veins, speeded up from some X or ultra-violet or alpha and omega ray photography machine which may penetrate the darkness of the rocks and allow focusing at a certain depth. Maybe some succeeding reviewer may find this leap of the imagination tame and falling short of the fact, but we doubt it.

Quantitative Microscopic Determination Of Minerals in Ore Pulp

THE MICROSCOPIC EXAMINATION of ore pulps is useful in understanding difficulties encountered in ore dressing. As ordinarily carried out, the pulp is screen analyzed and the individual sizes are examined. The results in conjunction with assays and analyses enable consistent conclusions to be drawn. The principal difficulty, however, is in making quantitative estimates. At best these are inaccurate, as the individual grains are rough and the lighting is irregular.

R. E. Head, of the Bureau of Mines, describes a novel use of a petrographic method in the June *Reports of Investigations* of the Bureau, which promises to be helpful to everyone interested in ore-dressing problems. It has the advantage of increasing the accuracy of quantitative estimates made by use of the microscope. It consists in taking samples of the screen sizes of the pulp and incorporating them uniformly in molten wax held in a conveniently sized mold. The greater part of the sample settles to the bottom of the mold during cooling. The briquet thus made is polished on its lower surface. The polishing cut can be made as deep as desired and additional surfaces exposed by further grinding. The resulting surface is ready to be examined by reflected light, using the usual equipment. A net-ruled micrometer disk is required for quantitative estimates, and etching with chemicals is possible to bring out differences in the minerals where their surface appearance is not such as to admit of ready identification.

In our opinion this is a practical method of considerable importance in defining limits of ore-dressing methods—and well worth the attention of metallurgists. The Bureau of Mines, in encouraging individual research of this kind by developing adequate methods, is working in the right direction.

WHAT OTHERS THINK

The Zinc Tariff Indorsed

Anent your recent references to the "Metals and Manufactures of" Schedule of the pending Tariff Bill:

There is not a large zinc producer in the United States who is not represented in the American Zinc Institute, and who does not approve of the action of the Institute in regard to a tariff, including those who also produce copper.

The zinc industry of the United States is confidently resting its claims for an adequate tariff on its ore and products upon the conviction that, notwithstanding the fact that Europe's financial and industrial rehabilitation must depend in part upon the sale of her products to the rest of the world, a majority in the House and in the Senate and the President of the United States do not believe that this rehabilitating should be done at the cost of crippling a domestic "key industry," patiently built up through the years to supply the home market at a reasonable price, or at the cost of reducing to the European level the living standard of American workmen especially trained in the industry.

New York, N. Y. S. S. TUTHILL,
Secretary American Zinc Institute, Inc.

Mexico From Without In

Living close to the Mexican border and making periodical trips into Mexico enables me to obtain a general viewpoint of that country from both "the inside looking out and the outside looking in." It has occurred to me that a word of warning at this time would be opportune.

Mexico, the Land of Contrast; the Land of Extremes; the Land of Mañana. And when "tomorrow" comes Mexico will be one of the most productive countries of the South. Her mineral resources have been developed only to a small extent, even though mining operations have been conducted there since the sixteenth century. Her wonderful acres upon acres of grazing lands are largely untouched; her large areas of agricultural and horticultural lands are still mostly virgin soil, and her many mountain streams still remain to be harnessed for both power and irrigation. Truly a wonderful country—a country of remarkable promise.

From Mexico this year will come hundreds of attractive propositions for capital. Mexico needs American assistance. Where there are such opportunities there will be those who will endeavor to interest capital in propositions which are either premature or are not commercial risks.

It must be remembered that Mexico is an old country and yet sadly lacking in most of those things which make America "home" to Americans. Mexico lacks sanitation; Mexico lacks transportation. It matters little that a certain locality can raise an abundance of foodstuffs if its produce cannot be marketed at a profit. Neither does it mean that a mine is worth one hundred thousand dollars if it has developed one hundred thousand dollars' worth of ores. The mine may be so isolated that the net worth of that ore is nil.

Many of the old Spanish mines, the *antiguas* will be placed upon the market, and it is often stated that "if those old-timers could make money from a mine with their crude methods and obsolete ideas, modern methods and equipment can reap fortunes." In this connection it is well to remember that the *antiguas'* labor cost was very small, as their laborers were practically slaves—the element of time was not a factor with them; their initial expense for equipment was very small and usually commensurate with the size of the orebody which they mined out. They could then move on to the next prospect with but little expense.

This is not to discourage investments in Mexico but rather to suggest that one study their problems carefully; be conversant with them from every available angle, before making the investment; look facts square in the face before starting, and then if the investment is sound the chances for success are good. A careful investigation and analysis of conditions is half of the battle.

Americans as a people do not understand either the customs or environments of Mexicans any too well, and for that reason it is often best to look the "home fields" over carefully before undertaking the development of foreign lands and problems. C. A. PIERCE.

Patagonia, Ariz.

The Original Alchemist

I have been also reading with major concern the artikles by both Dr. Davis and the sekondary Mr. John Hirtman of Rathdrum Idaho because they are both guilty of plagerism and nether of these so called scientists have any thing on me because I made gold and platnum and silver and merkury out of cheap metals and barren quartx long before they did as I can prove any time and besides nether of these so called scientists rite like they was real scientists or deep chemists like me. For may years I have been a deep scientist and chemist and I no all about that H too O makes water and such things as are to deep for most mining engineers and most any day if you would drop around to my caben in the Gulch you could see me pouring acids together to recearch science and discover the lost arts as how already I diskovered gold & transmooting like alkemy which is lost art and you would be amased to see the row of deep chemicals on my slelves way out here in the wilderness you would see muratic acid and rock vitrel acid and varous tinctures and several genuine emulshens that I made all alone and I have gone so deep I have made perceptitates that are deeply visible to the eye by a powerfull mikreskope I have. Now this is my own discovery that the deep books dont know or say nuthin about that perceptitates and mollekules are one and the same thing that I diskovered and Dr. Davis or Mr. John Hirtman dont know nothing about this subgect like I do which proves they are faking and now this is the basik principal of my diskovery of transmooting base metals to high grade and I can tell you just how I do it and prove it except there is one thing

I keep sekret and I will put up for forfit one of my best claims in the Gulch that I can make gold. Now everybody knows gold kloride is not real gold now of Dr Davis and Mr Hartman will read this closely and follo me they may see the inner lite. Now follo closely. I will frankely revel all but one vitel pint. I can take some iron or brass fileings and put them in my vitrel acid for a moment onlty to cote them with a laer of rearanged mollekules then i take them out and dri them and emerge them with gold kloride. This is the first or primary step in transmooting and is the basic principal of alkemy. Then I put it all back in some H too O then is where my own sekret comes in for I add some stuff which is gassy in its fundemenatel mollekule perception and which I make in a mystical manner out of base metal pyrite and on of my secret acids and when I add this strong smelling mysterous gassy the final or secondery stage of the transmooting takes place and very visebely one can see the mollekules come out and make the clear sulution full of floting mollekules where there was none before which proves I fundementely made mollekules out of nothing viseble and transmooted. Now I cook it all till there is no more licker and and when I give the dry mass to any of your high fangled assayer fellers they inverbly return high assays and if Dr Davis or Mr. Hartman dont beleve me or any other parteys dont ether just rite me and i will show assay certificates as high as $9,000 to the ton and if that all isent convencing you can just rite to the assayer feller at the Great Eagle Flourspar company who are operating in the next gulch to me and for farther absulite proof you can rite to the manager of this company who witnessed while visiting at my caben and saw my rows of bottles and who was astonished and amazed as he admitted to see my real tinctures and emu'sions and see me make molekules out of cler H too O suliten with only gassy as a regent. Now this gassy is the secret I wont tell to nobuddy and if gold kloride was only cheaper and would drop in prices as beens and other cummodetys have done I could transmoot tons of base metals to alloys runnin thousnads of dollars per ton and I no all about mollekules and gasseys and I read all kings of chemists books and I know all about transmooting which they books dont tell of and how different mollekules make eliments like gold and thalium and platnum and how gasseys change one into another more precious secretly and I am now perfecten my proces on the later metals so eventuly platnum will be as cheep as copper and I have one bull quartz ledge running up my gulch bigger than all Mr Hirtmans 75 ledged put together as they are most likely stringers and pinch out at that whis mine dont do and I have some pyrite ledges also and I am going to transmoot it all so gold and platnum will be cheep as soon as the trust stops overcharging robber prices for gold kloride and I protest agenst such robber prices and I think the Mine and Smelter supply company shud be indeted under the Sherman ante trust law for when I have to buy a bottle of gold kloride off them fellers they charge me like it was real gold which it isnt and they think us poor prospecters are green and take adventage but when the prices drop I can make tons of it as I make my gassey very cheap but this gassey is the whole secret. It smells bad but it does the work and I am also perfectin 'a mineral finder which is not a fake like most of those witch sticks your magezine writes of sometimes but mine' is founded the mollekule principals but I havent got it working yet but will rite you a descriptive on it in a few weeks for publecion and I also use a secret gassey in this also. I will close by aserting that I am the real original transmooter since the art was lost by the Egeptions and I protest agenst giving Dr Davis or Mr Hirtman these honors as I am the originator and I alone know the gassey secret and I wont tell.

JOSUA HARBREN

Lordsburg, N. M.

Mine Taxation in Ontario

Mr. Drury, Premier of Ontario, has been touring the northern part of the province, and has been speaking before several audiences, more particularly to the farmers, which party he represents. He has stated on more than one occasion that the natural resources, forests, and mines must contribute a greater share of the provincial revenue.

Mr. Drury is like a number of other partly educated people who fail to realize that a mine is a wasting asset, and who talk as if the large returns made by some of the northern mines were dividends in the strict sense of the term, and would go on forever. The Cobalt mines have made the largest returns, but the camp has now reached the stage where comparatively small profits are being made from the mining and treatment of its ores.

It is probable, however, that the mining companies themselves, through carelessness and poor accounting methods, are partly to blame for the attitude of such men as Mr. Drury. When they make disbursements to shareholders they always call them dividends. In addition, the Ontario law does not permit the companies to make any allowance for depletion, in making tax returns.

In order, however, that the public and public men should be better informed on this matter, it would seem to be a good policy on the part of the companies, when making disbursements to the shareholders, to state what percentage represented the return of capital and what percentage was profit. Some of the companies intend to make capital disbursements, but though this may be of some assistance, from the point of view of the person who pays income tax, it will have little effect on the public ignorance of what constitutes profit from a mine.

July 25, 1921. A CORRESPONDENT.

Experts for the Mining Society Business?

Observance of the editor's reaction to the *National Geographic Magazine* membership idea, and later his temptation to adopt this idea in defense against *Mining and Metallurgy*, moves me to the following quotation:

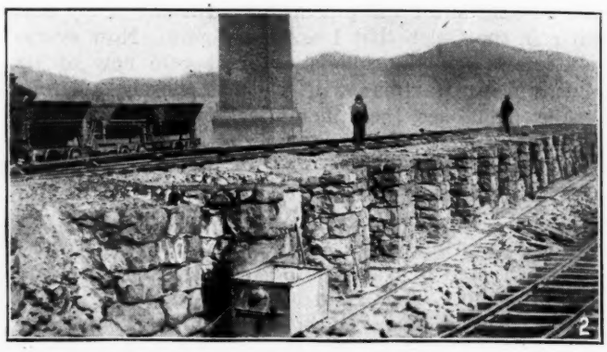
> Vice is a monster of so frightful mien,
> As to be hated needs but to be seen;
> Yet seen too oft, familiar with her face,
> We first endure, then pity, then embrace.

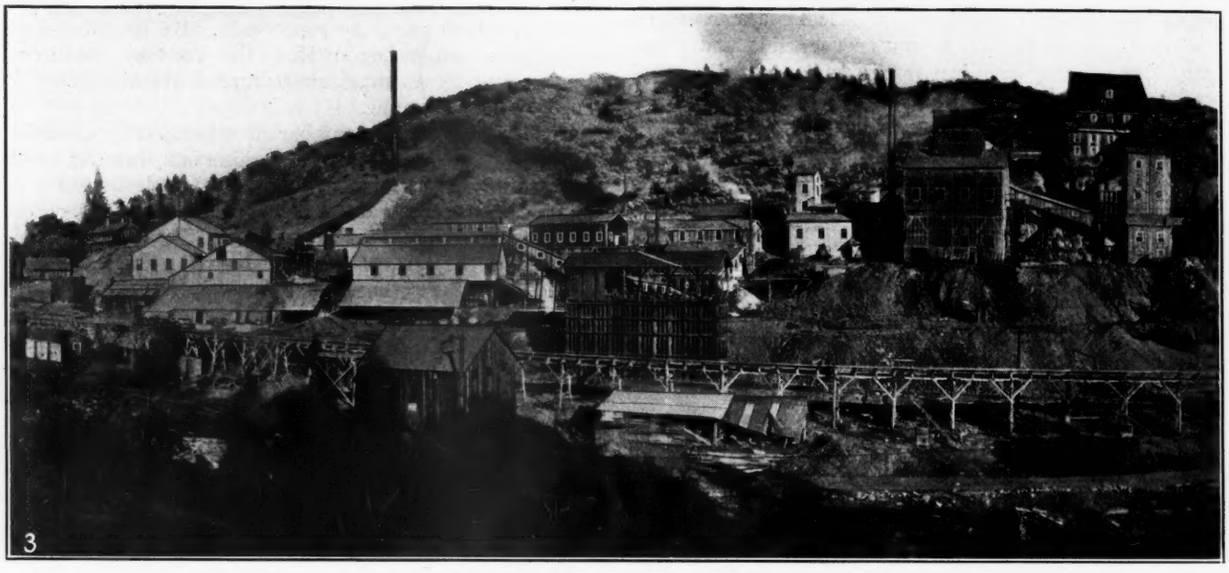
For the Editor's information, when he gets ready fully to adopt this vice, I might state that the proper technic or procedure today, in introducing questionable methods into business, is to hire an "expert" and pay him several times what those of us with old-fashioned consciences can ever hope to attain. In this case an advertising expert, I suppose.

Which all shows that the world has advanced a little from the time when a professional murderer took care of one's rival, at a fee much larger than an honest man could hope to receive.

PAUL R. COOK.

Rolla, Mo.





1—THE BULLY HILL SMELTER IN 1901. 2—STALL ROASTING AT BULLY HILL IN 1901.
3—THE AFTERTHOUGHT PLANT AT INGOT

Metallurgical Progress in Shasta County, Cal.

Operations at Keswick, Martinez, Coram, Kennett, Ingot, and Winthrop—New Plant of Shasta Zinc & Copper Co—Zinc Burning In a Reverberatory—The Treatment of Zinc-Copper-Silver-Gold Ores

BY GEORGE J. YOUNG
Western Editor, *Engineering and Mining Journal*

THE INTERDEPENDENCE of mining and metallurgy is shown in a striking way in the progress of the copper-mining industry in Shasta County, Cal.; also, the conflicting interests of farmer and miner. Important mining operations have taken place at Iron Mountain, Kimberly, Mammoth, Winthrop, and Ingot. The present larger companies are the Mountain Copper Co., Ltd., the First National Copper Co., which took over the Balaklala Consolidated Copper Co.; the U. S. Smelting, Refining & Mining Co., the Shasta Zinc & Copper Co., and the Afterthought Mining Co. Smelting plants were operated at Keswick, Coram, Kennett, Winthrop, and near Ingot. Branch railroad lines were constructed from Pitt to Winthrop and from Bella Vista to Ingot.

The Balaklala properties were connected by a 16,130-ft. Bleichert aërial tram to Coram. Transportation from Mammoth to Kennett was by a narrow-gage electric railroad, a 4,000-ft. gravity incline and a standard-gage track with locomotive haulage. At Iron Mountain an eleven-mile, narrow-gage track connected with Keswick. At present, except for the construction and development work of the Shasta Zinc & Copper Co. at Winthrop and the operations of the Mountain Copper Co., Ltd., little activity is to be recorded, and the mines, smelters, and mills are idle.

METALLURGICAL PROGRESS

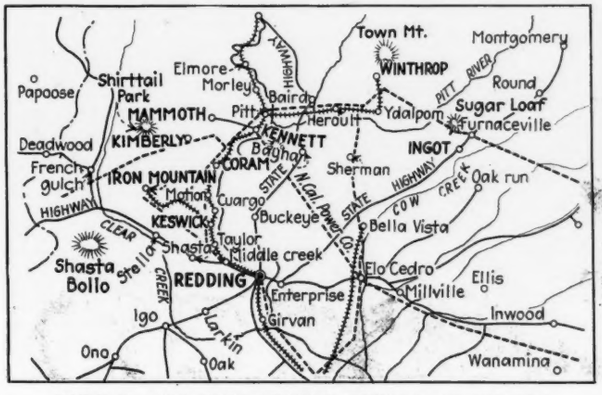
The significant metallurgical development is sketched in the following:

Keswick and Iron Mountain—A pan amalgamation mill was operated in the 80's at Iron Mountain. It was shut down in 1888. A chlorination plant, the Butters Ore Milling Works, was operated at Kennett in 1889. These were early attempts directed at the oxidized surface ores. The Mountain Copper Co., Ltd., established successful blast-furnace smelting of the high-sulphur copper ores in the late 90's. Pyritic smelting with the

aid of hot-blast stoves became the established practice for a time.

The smelting plant at Keswick was discontinued about 1908, and smelting was conducted at a plant not far from Martinez, Cal. This plant contained roasters, a sulphuric-acid plant, and reverberatories. A 150-ton leaching plant for treating low-grade cupriferous calcines was installed in 1917 at Martinez and successfully operated. Near Iron Mountain a 250-ton flotation mill was put in operation in March, 1915, and successfully operated on siliceous chalcopyrite ores, the concentrates being shipped to Martinez. The flotation mill was enlarged in 1917 by a second unit, but this unit was not operated, and the first unit was closed down in March, 1919.

Government restrictions on pollution of stream flow began about 1902, and restrictions on smelter smoke took effect in 1905, although agitation by smoke farmers began in 1898. Since closing down, the operations of the Mountain Copper Co., Ltd., have been restricted to mining and marketing pyrite from its Hornet mine and the manufacture of sulphuric acid and superphosphate at its Martinez plant.



COPPER AND ZINC MINING REGION OF SHASTA COUNTY, CAL.

Coram—The Balaklala Consolidated Copper Co., since taken over by the First National Copper Co., started a smelter in 1908. The equipment was three 600-ton blast furnaces, 56 x 240 in., one 17 x 96-ft. reverberatory, and converters. Fume litigation shut the plant down in 1909. A Cottrell precipitator, then neutralization of fumes by zinc oxide, and the Young, Hall, and Helsewood processes were successively tried out without meeting the requirements of the courts. The mine was closed down in 1914, reopened in 1915, and until May 13, 1919, shipped ores to the Mammoth smelter, at Kennett. Difficulty of meeting the smelter-smoke problem and low metal prices stopped operations. The smelter was recently dismantled.

Kennett—The Mammoth Copper Mining Co. of Maine, subsequently a subsidiary of the U. S. Smelting Co., operated a copper smelter at Kennett. The plant consisted of five blast furnaces and converters. Fume litigation interfered with the operation of this smelter also, and various efforts were made to make the effluent gases innocuous. A Cottrell precipitator was tried, but finally a baghouse and neutralization of the fume by zinc oxide enabled the smelter to operate. An electrolytic zinc deposition plant was erected to recover zinc from the baghouse product. Custom ores from copper mines in Shasta County and siliceous ores from California, Nevada, and Oregon were treated. About two years ago the smelter was shut down, and the mine was closed down in March, 1921. The demoralized condition of the metal market was chiefly responsible.

Ingot—The Afterthought Copper Co. presents an interesting metallurgical sequence. A blast furnace of seventy-five tons' capacity was first installed, and under S. E. Bretherton, as general manager of the enterprise, a fair profit was made. Mr. Bretherton operated the furnace with hot blast and a hot top. The difficulties were many. Coke was obtained from Australia and was hauled over twelve miles of bad roads. A sufficient profit was made to further develop the mine and construct a blast furnace unit of 300 tons' capacity. This was put into operation at half capacity, as sufficient fuel could not be hauled in to operate at full capacity. Until the price of copper dropped below normal, profit was made. The plant was then closed, and the directors of the company determined to make no further effort to operate until some method of saving the zinc had been worked out, as the ores averaged from 14 to 18 per cent of that metal.

In 1917, under a new management, a flotation plant was installed with the object of recovering as concentrates all the metals in the ore and then giving the concentrates a light roast. The roasted concentrates were treated by the Horwood process for the separation of the zinc from the copper concentrates. After considerable expenditure in an effort to make the process work, it proved a failure and was abandoned. Selective flotation was also tried thoroughly, and proved a failure. A reverberatory furnace was constructed, and experimental operation continued for several months, but the low price of metals prevented profitable operation, and the enterprise was closed down. Tests proved the Afterthought ore to be favorable for zinc electrolytic treatment, and a plant for this process was included in the equipment plans, but it has not been constructed. The ore is stated to average approximately 3 per cent copper, 14 per cent zinc, 5 oz. silver, and 40c. gold per ton.

Winthrop—On the Bully Hill property a small blast-furnace and converter plant was operated by J. R. De Lamar until 1905. Stall roasting was practiced, and the flue dust was briquetted and smelted. The capacity was 150 tons per day, and the plant operated successfully. The General Electric Co. assumed control by purchase in 1905, and increased the capacity of the smelter. Matte was shipped to Kennett. A small reverberatory, 35 x 16 ft., was erected for flue-dust smelting.

An increasing amount of zinc in the ores interfered in smelting operations. Litigation over smelter smoke and fume also contributed to the difficulties, and the smelter was closed down in 1910. During this period a branch railroad was completed connecting Winthrop with the Southern Pacific. After closing the smelting plant, ores were shipped to Kennett. A small experimental plant for electrolytic recovery of zinc was installed. Experimental work was concentrated upon electrolytic deposition from zinc sulphate solutions, and the experiments were carried to a successful conclusion. A production of 300 to 400 lb. of zinc was made per day. This campaign of experimental work started in 1911 and continued until 1915.

It is of general interest that the work of J. B. Keating, as general manager, and C. A. Hansen and H. R. Hanley, metallurgical engineers, was in part pioneer work in the hydrometallurgy of zinc and was of material assistance to the subsequent work at Kennett, Great

Falls, Trail, and in Tasmania. In 1917, Walter Arnstein and his associates bought the Bully Hill property and developed additional ore. During 1918, a total of 30,000 tons of copper ore was shipped, and large tonnages of zinc ore were exposed.

A 150-ton flotation mill was completed in 1919 in a building adjacent to the old blast-furnace building. Attempts at selective flotation resulted in the indifferent separation of the copper and zinc minerals. High freight rates to zinc smelting centers also compelled consideration of other methods.

The flotation mill was shut down, and experiments were carried out with the object of finding a more direct method of treating the "complex ore" and of recovering all of the marketable metals. Following initial tests, working-scale experiments were conducted at a Colorado plant, and promising results were obtained. Subsequently, the Shasta Zinc & Copper Co., a new corporation formed by Hayden, Stone & Co., and D. C. Jackling, acquired an interest in the property from Walter Arnstein, and continued the preliminary work, which finally reached such a point that the erection of the plant a description of which is given in this article was begun.

The first difficulty which acted to restrict smelting operations in earlier times was the litigation engendered over smelter smoke and fume. The companies west of the Sacramento River attempted to solve the problem in various ways. The Iron Mountain Copper Co., Ltd., constructed a new plant near Martinez, and avoided further trouble by making sulphuric acid. At Coram and Kennett, exhaustive attempts were made to control the waste furnace gases, with the result that only the Mammoth plant continued to operate. This plant served for a while as a general custom plant for the various mines, but the stagnant metal market eventually caused discontinuance of operations.

The Bully Hill group and the Afterthought, constituting the principal properties east of the Sacramento River, developed important tonnages of zinc as well as of copper ores. The copper ores were handled without much difficulty, but as these ores became scarcer and a greater and greater proportion of zinc obtruded itself, an effort was made to turn the zinc to some account. The intimate association of the zinc and copper made differential flotation a doubtful solution of the difficulty. The cost of railroad transportation for zinc concentrates to smelting centers threatened to eat up whatever profits there might be from flotation concentration. Treatment of zinc ores on the spot by hydrometallurgical processes and electrolytic deposition of the zinc had been experimentally developed and commercially applied to the baghouse fume at Kennett. Electrolytic zinc deposition appeared to offer a solution of the zinc difficulties, but neither company attempted the process on a working scale.

It is an open question whether the electrolytic zinc process as usually practiced can be satisfactorily applied to the zinc-copper-silver-gold ores characteristic of the Winthrop-Ingot area. The ore is low-grade with respect to zinc, and contains a high gangue and iron content, and, in the Ingot ores, calcite. A relatively high copper content is also present. Up to the present, clean, high-grade zinc concentrates have been successfully treated in other places. At both Great Falls and Trail more complex concentrates containing about 30 per cent zinc have been treated, and the successful practice at these points indicates that lower-grade ores of 20 to 25 per cent zinc could be treated.

THE COUNTRY ABOUT WINTHROP. RISING STAR MINE OF THE SHASTA COMPANY AT LEFT CENTER

A clean separation of the zinc mineral by flotation would yield a product that could be handled, but although some of the ores undoubtedly did give good results by flotation, others did not, and a process that would be inclusive of all of the zinc ores did not appear to have been developed. If flotation and zinc hydrometallurgy had been decisively indicated, supplementary smelting of residues could not have been avoided. This would have resulted in a complicated process and plant. Direct treatment of the ore by the zinc electrolytic process and smelting the residues would give a simpler method. Recent improvements in the zinc electrolytic process by U. C. Tainton and N. C. Pring indicate important economies in applying the electrolytic zinc process and render lower-grade zinc ores more amenable to treatment. This might therefore change the status of the electrolytic zinc process as applied to the low-grade zinc ores of Shasta County.

Later Operations at Winthrop

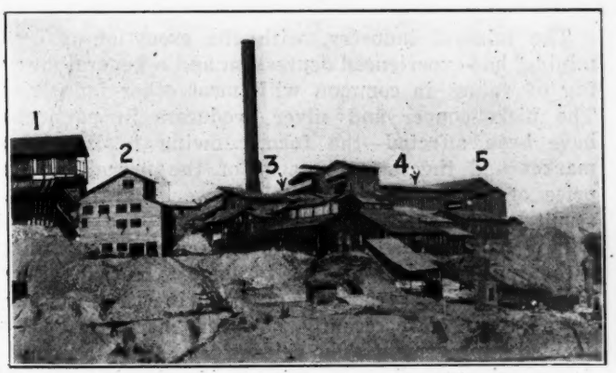
Investigations at Winthrop, as mentioned before, offered another way out. The method to be used by the Shasta Zinc & Copper Co., in brief, consists of charging a mixture of fine, roasted ore and coal dust into a copper-smelting reverberatory. The heating of the mixture to the temperature of the reverberatory will reduce zinc oxide to zinc and volatilize it. The

volatilized zinc will oxidize in the furnace gases and pass off with them to be recovered in the flues. The residual ore mixture will be smelted in the reverberatory in the usual way.

The process is in part protected by patent No. 1,276,058, granted to R. G. Hall, and was developed under that patent in its practical applications by the River Smelting & Refining Co. at Florence, Col. It is evident that the method thus briefly described offers means for the separation of the zinc from the zinc-copper-silver-gold ores available. Experiments at Winthrop and records of its use at Florence indicate its success, but until the present plant has been thoroughly tried out, the future of the process cannot be safely predicted.

The Rising Star Mine, of the Bully Hill group, has been opened down to the ninth level. Large tonnages of ore have been blocked out, with prospects of materially increasing the present tonnage. From assay maps of the old company, which operated several mines, there is good reason to expect greater tonnage, and especially so in the so-called Bully Hill mine. Over one-half of the calculated value of the present ore lies in its zinc content, which averages 22.5 per cent. The copper, silver, and gold in the ore are less than in that mined by the old company. The aggregate value of these metals is such, however, as to make the per-pound cost of the zinc recovery very low.

Clean mining is necessary, and as a consequence square-set stoping or some modification of it will be practiced. The ore will be hoisted to the No. 5 level of the Rising Star, and from this point will be trammed over an 18-in. gage mine track, 1½ miles long, to the crude-ore bins of the smelter. Over the crude-ore bins also are tracks for the receipt of custom ore and ore from the Bully Hill mine. In addition to the crude-ore



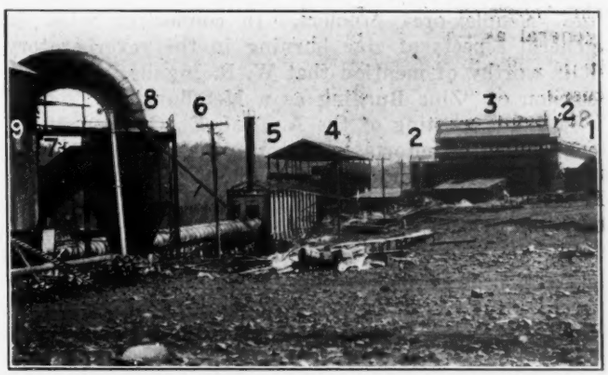
GENERAL VIEW OF SHASTA ZINC AND COPPER CO. PLANT AT WINTHROP

1—Crude-ore bins. 2—Crusher buildings. 3—Old mill and blast-furnace building. 4—Fine-ore and charge bin. 5—Reverberatory building.

bins, several bins are allotted for fluxes and a two-day supply of coal. The coal bins are lined with "gunite." The bulk of the coal, principally slack, will be stored in yards. In all there are eight receiving bins constructed of timber and provided with steel chutes and tightly closing gates.

Description of the New Plant

From the receiving bins a belt conveyor carries the ore to a 10 x 20-in. jaw crusher, where it is reduced to 2-in. size. A 20-in. belt feeder draws the ore from a small surge hopper and discharges into a 37½ x 15-in. set of rolls, where it is reduced to ⅝-in. size. The discharge from the rolls is conveyed by a 16-in. bucket elevator to a vibrating screen, the oversize going to a second set of 37½ x 15-in. rolls and being returned to the elevator. The rolls are of the heavy-duty type. The screen undersize is automatically sampled and delivered to a conveyor, which is equipped with a weightometer. The coal may be sent through the crusher or bypassed around it. The undersize ore is finally conveyed to any one of eight storage bins of a set of sixteen bins, set back to back in two rows and each having a capacity of 2,200 cu.ft. The remaining eight bins are used for the reverberatory furnace charge, consisting of calcines, flux, and coal. Under each fine-ore bin is a belt feeder



THE SHASTA PLANT

1—Conveyor from crusher building. 2—Fine ore and charge bins. 3—Roaster building. 4—Reverberatory building. 5—Combustion chamber. 6—Flues. 7—Fan outlet. 8—Cyclone settler. 9—Baghouse.

which permits a predetermined flow to the conveyors leading to the McDougall roasters.

The four McDougall roasters are housed in an all-steel building. The roasted ore is discharged to steel-flight conveyors and conveyed back to the opposite side of the storage bins, cooling en route, and sprayed if necessary for further cooling. The calcines are stored in five bins, the remaining three being used for coal and flux. All bins are "gunited" with a lining 3 in. in thickness.

The furnace charge is made up by belt feeders which deliver to a conveyor. A bucket elevator elevates and assists in mixing the charge before it goes into the hoppers of the reverberatory. The reverberatory is of a type common in copper-smelting plants. It is housed in a steel building 55 x 110 ft. Fuel oil will be used for firing. The slag is to be handled in five-ton hand-operated slag pots hauled to the dump by storage-battery locomotives. The matte will be handled in matte cars, cooled, and loaded for shipment in railroad cars.

The waste gases are drawn off into cooling flues and are handled according to the practice prevailing at a modern zinc-oxide plant. Exhaust fans are used to draw the gases through the flue system. All gases are filtered through bags. The baghouse is a steel structure containing four fireproof compartments, each compartment having four transverse hoppers which connect with eighty-eight bags. The bags are 18 in. in diameter and 25 ft. long. Mechanical shaking apparatus is used. The zinc oxide is collected from the hoppers by a vacuum collector which discharges into a rotary air trap. The zinc oxide is discharged from the air trap by a screw conveyor, which delivers to cars, and these in turn to the storage building (92 x 141 ft.).

The storage building contains a number of bins in which the zinc-oxide product can be distributed according to analyses. The object of this selection and distribution is to secure uniformity in product. The capacity of the bins in the aggregate is equivalent to a month's run. A bolting machine, a mixer, and a packer complete the equipment of the storage house.

The buildings, roasting, reverberatory, packing and storage, were constructed of the material salvaged from the dismantling of the Balaklala smelter at Coram. The plant was designed by Bradley, Bruff & Labarthe.

The results of the operation of the new plant, which was started June 7 of this year, will be awaited with interest, as its success will go a long way toward solving the "complex-ore" problem. In connection with the general aspects of zinc burning in the reverberatory, it is worthy of mention that W. R. Ingalls, in his discussion of "Zinc Burning as a Metallurgical Process" (St. Louis meeting of the A. I. M. E., October, 1917), commented on efforts to remove zinc by volatilization in the reverberatory and stated that "It remained for Frederick Laist, at Anaconda, Mont., to make zinc burning in the reverberatory furnace a successful large-scale process. This was done early in 1917 for the extraction of the zinc remaining in the residues of the leaching for electrolytic zinc extraction." Commenting further, he stated: "As between Wetherill-grate burning and reverberatory-furnace smelting and burning, I think it impossible to lay down any hard and fast rules. The subject has been insufficiently studied and analyzed. Reverberatory smelting follows the same lines as for the treatment of copper ore, but sufficient carbon is mixed with the charge to reduce the zinc oxide. No great excess over the theoretical quantity is needed, the conditions being very different from those of the retort for distillation. Nor does it appear that the quantity of coal that must be burned in the fire-box is greatly in excess of what is used in smelting an ordinary copper ore." It would thus appear that the new plant, in its broader aspects, is not without precedent.[1]

Chromite in 1920

Domestic chromite amounting to 2,502 long tons, valued at $44,857, was sold in 1920, according to the U. S. Geological Survey. Before the war the United States produced annually about 250 long tons of chromite. By 1918 the output had risen to 82,430 long tons, the largest ever recorded by any country. In 1919 it had fallen to 5,079 long tons, valued at $129,302. Only nineteen mines shipped ore in 1920, as compared with thirty-three in 1919. Of these nineteen mines seventeen are in California, one is in Oregon and one is in Wyoming. Although California still led in production in 1920, her part was reduced from 64 to 57 per cent of the total. The proportion of the total furnished by Oregon increased from 11 to 38 per cent, but that furnished by Wyoming decreased from 24 to 5 per cent. A small quantity of ore was mined in Montana and in Maryland, but none was shipped from either of these states.

The imports of chromite in 1920, as reported by the Bureau of Foreign and Domestic Commerce, were 150,275 long tons, valued at $1,921,824. This quantity is 30 per cent more than that imported in 1916, the year of next largest imports, when they amounted to 115,945 long tons. Only 61,404 long tons was imported in 1919. Much of the ore imported in 1920 is reported to be carried in stock, and the large imports appear to be due not to any insistent demand for ore for immediate consumption but rather to the extremely low price at which the ore could be purchased in the countries of origin. Rhodesia and New Caledonia supplied 71 per cent of the ore imported.

[1]The paper of George C. Stone on the subject "Oxide of Zinc," St. Louis meeting, A.I.M.E., October, 1917, is well worth reading in connection with this article, as it gives full details of zinc burning and the handling of the zinc oxide.

Ontario's Mineral Production for the First Quarter of 1921

Returns received by the Ontario Department of Mines from the metalliferous mines, smelters, and refining works of the province for the three months ending March 31, 1921, are tabulated below. For purposes of comparison the quantities and values are given for the corresponding period in 1920. Tons throughout are net tons of 2,000 lb.

SUMMARY OF ONTARIO METALLIFEROUS PRODUCTION, FIRST QUARTER OF 1921

	Quantity		Value	
	1921	1920	1921	1920
Gold, oz.	111,096	142,840	$2,296,522	$2,953,036
Silver, oz.	2,106,045	2,280,665	1,226,551	2,954,695
Platinum metals, oz.	445	100	19,179	7,172
Copper, lb.	1,562,150	1,508,014	206,064	242,630
Copper in matte exported (*a*) tons.	222	1,976	35,520	553,280
Nickel in matte exported (*a*) tons.	519	4,571	259,500	2,285,500
Iron ore exported, tons.	22	44	99	322
Iron, pig(*b*) tons.	16,208	13,428	467,538	344,241
Cobalt, metallic, lb.	81	46,479	365	108,430
Cobalt, oxide, lb.	27,242	213,024	70,075	340,232
Nickel oxide, lb.	5,133	1,788,183	2,105	413,944
Nickel, metallic	2,855,698	2,159,316	1,000,240	753,169
Other nickel compounds, lb.	2,364	159,183	189	15,308
Other cobalt compounds.	.....	1,417	.....	1,417
Lead, pig.	809,440	509,075	42,832	48,278
Totals			$5,626,779	$11,021,654

(*a*) Copper in matte was valued at 14c. per lb. in 1920, and 8c. in 1921. Nickel was valued at 25c. per lb. for both years.

(*b*) Total output of pig iron was 147,345 tons, worth $4,250,347. Figures in the table represent proportional product from Ontario ore.

The mineral industry, with the exception of gold mining, has experienced depression and a general lowering of values in common with most other industries. The nickel-copper and silver producers in particular have been affected—the former owing to lack of a market and the latter because of the prevailing low price of silver. Hydro-electric power shortage, as a result of unusually low water during the fall and winter months, had the effect of seriously curtailing the output of gold and also, to some extent, of silver. The iron and steel trade was quiet during the early part of the year. More recently, however, there has been a decided improvement. The price of lead shows a marked decline, although the output is considerably in excess of the first quarter of 1920.

Algerian Phosphate Industry

According to a report from David C. Elkington, vice-consul at Algiers, there was a total production of 502,931 metric tons of phosphate in Algeria during 1920. Of this amount, 351,221 metric tons was exported.

During the first quarter of 1921 the production amounted to 133,106 metric tons, an increase from the production of the corresponding period of 1920, which was 88,826 metric tons. The statistics, however, show a decrease from the last quarter of 1920, during which period 172,494 metric tons was produced. The exports of the first quarter of 1921 are given as 82,595 metric tons, compared with 44,335 metric tons for the corresponding quarter of 1920 and 128,769 metric tons for the last quarter of 1920.

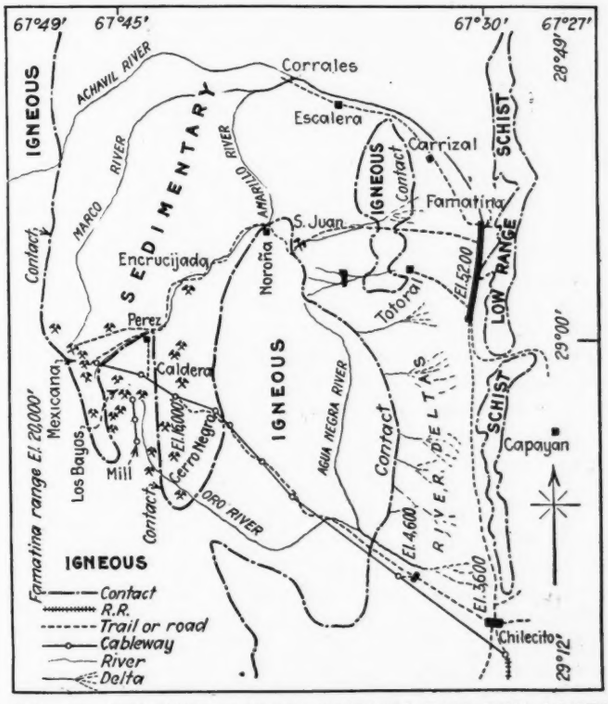
Mining in Argentina

Famatina Copper Mines, in Chilecito District, Most Important Mineral Project in Country, Aside From Petroleum—Gold, Silver, Lead, Mica, Asbestos, and Coal Also Found—Placers at Corrales—Climate Dry—Present Exchange Situation Curious

By Myron R. Walker
Written for *Engineering and Mining Journal*

THE FAMOUS COPPER MINES of Famatina are on the eastern slope of one of the highest mountain ranges in western Argentina. The Famatina Range lies east of the main Andean Cordillera and rises in the central part of the Province of La Rioja, the plateau at its eastern base having an elevation of about 3,600 ft., the ridge above the mines 19,700 ft., and the highest peak, called Mexicana, 20,300 ft.

The mineral region is roughly a right triangle with a northern base five miles long and an eastern base six miles, and a southwestern hypothenuse eight miles in length. It is locally divided into four minor districts, called, respectively, Mexicana, in the western corner; La Caldera, in the northeastern corner; Cerro Negro,



MAP OF CHILECITO REGION, SHOWING FAMATINA MINES

in the southern corner, and Los Bayos midway along the hypothenuse. Of these the Mexicana is the most important and best known and lies at latitude 29-00 South, longitude 67-47 West. The elevation at the mine workings is from 15,100 to 16,500 ft.

Extreme Natural Conditions Impede Prospecting and Development

The general geology of the region has been roughly plotted in the accompanying sketch. The core of the range is an intrusive rock ranging from quartz diorite through quartz porphyry to dacite porphyry. On the eastern slope of the mountains the adjacent Paleozoic rocks are usually metamorphosed to some extent and include conglomerates, sandstones, quartzites, slates, and schists. Limestone is rare above an elevation of 10,000 ft. In the Mexicana district, which is all above 15,000 ft., the rare atmosphere of 8.2 lb. per sq.in., the steep trails of from 10 to 50 per cent grades, the mean temperature of about 40 deg. F., and the almost daily gales of fifty miles per hour have all contributed to deter leisurely geological studies. The same is true to a lesser extent of the districts of Los Bayos, La Caldera, and Cerro Negro.

It is known that several of the veins in the Los Bayos district occur in the igneous rock. In the sedimentaries the regional surface maps show no mines (except placers) that are more than 7,000 ft. from the igneous contact. It is extremely probable that at the most outlying mines vertical exploration would encounter the igneous contact within 7,000 ft. depth. All the Mexicana mines are on intrusive veins, where the main mineralizations are on veins striking east and west, approximately normal to the line of igneous contact. In veins parallel to the contact, ore is generally found only at and near the intersection with normal veins. The western prolongation of the Mexicana veins toward the diorite contact has not been sufficiently explored. The location of the contact is plainly visible from a distance of two to three miles, as it is marked by a broad belt of yellow to brown limonite. All the Mexicana veins are pyritic. The evidence, then, so far as it goes, points to a body of pyrite at the contact with a capping of oxides, and intrusions from this ferruginous mass into the known vein systems.

Longest Cableway Known Connects Mines and Railroad at Chilecito

The mines are connected by a thirty-five-kilometer Bleichert cableway with the railroad at Chilecito. The cableway is government owned and constructed, and is operated in connection with the government railroad. It is said to be the longest cableway in the world. About twenty-eight kilometers from the mines there is a short branch cableway, privately owned, connecting the main line with the copper smelter at Santa Florentina, latitude 29-08 South, longitude 67-33 West. Buckets are of one-half-ton capacity. The cableway is operated only during daylight, and this limits its capacity to 300 tons of ore per day. Other considerations, connected with government operation, limit its capacity to 6,000 tons per month.

The severity of the wind currents along parts of the cableway is indicated by cases in which the haulage cable, with its suspended buckets, was wrapped around the rail cable. As the cableway is of use solely to the mines, it has had its ups and downs of maintenance according to mine periods of boom and depression. All machinery and supplies for the mines must be limited to pieces of half a ton or less and must pass the clearances provided for buckets. During regular smelter

operations the cable freight cost about 3 pesos per ton. Passengers are carried only by special arrangement and at exorbitant price, and then at their own risk. The trip is sufficiently thrilling during quiet weather and is positively dangerous even apart from wind accidents.

From the railroad at Chilecito, where the elevation is 3,600 ft., there is a seven-kilometer wagon road running northwest to the smelter at Santa Florentina, at an elevation of 4,600 ft. The grade is fairly uniform, at the maximum probably not exceeding 5½ per cent, but the road is not kept in repair, and as it crosses a delta of gravel subject to freshets it is difficult to maintain. The only heavy freight carried over the road is machinery that cannot be handled by the cableway or casual freight requiring transportation during interruptions of cableway service. It requires a twelve-mule team to haul two tons.

Famatina and Chilecito Connected via Auto

From Chilecito there is a twenty-eight-kilometer road running nearly north to the town of Famatina. This road is kept in fair enough repair to permit the passage of autos except during freshets, when there are certain fords which cannot be passed by any vehicles. The auto trip takes an hour and costs 50 pesos.

From Famatina one travels by bridle trail thirty-five kilometers nearly west to Mexicana. In fair and mild weather the trip can be made on good mules in seven hours. Horses are seldom used, as they more readily develop blind staggers on reaching high altitudes. Pack trains require one and a half days for the climb. The return trip can be made in four to seven hours, depending on the animals and the riders.

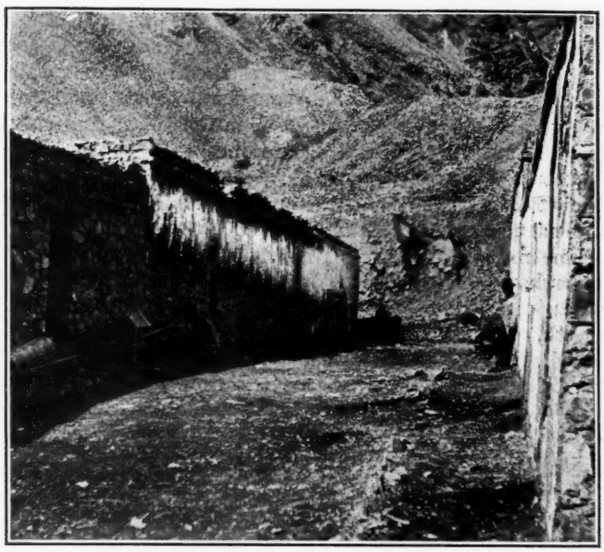
During June and July there are often days when the trail is impassable. The snowfall is not heavy, but the trails lie for the most part along the beds of gulches, into which the snow drifts to depths which prevent passage. At certain fords even a two-foot covering of snow over thin ice is a barrier dangerous to the life of both animal and rider. Snowslides present a further element of danger, both at the mines and along the approaching trails.

The mines are connected by private telephone with the village of Famatina, and here the government telegraph system connects to Chilecito. The mines are further connected by government telephone along the cableway to the various stations en route, including the smelter and the railroad at Chilecito. This line is primarily for the operation of the cableway and will be of little use to the mining operator unless relieved of red tape.

Mexicana Mines First Worked by Portuguese

At the Mexicana mines, the San Pedro vein has been opened along the strike for about 1,100 ft., and along the dip for 600 ft. It was first worked from surface at its intersection with the Espiga vein, a short cross-fracture worked for silver. The date of discovery is not known, but the mine is said to have been worked for silver by Portuguese before Argentine independence. What was once the Espiga mine is now partly open stope and partly dangerous caved ground without accessible approaches. This forms the most eastern development of the San Pedro vein, and it is not known that the vein extends beyond it. Below the original Espiga entrance to San Pedro there are seven levels at intervals of about 100 ft. along the dip of 68 deg. South. The total amount of drifting is approximately 5,000 ft., with raises on 190-ft. centers. There are two crosscut adits. Through the lower of these on No. 6 level all ore passes to the top of a surface gravity tram connecting with the loading yard at the cableway station. The vein when fully explored is seen to be fairly regular, but during exploration frequent hanging-wall slips deceive the miner.

The average vein width is 24 in. and the stoping width 33 in. The line of maximum secondary enrich-



AT LA MEXICANA MINES, FAMATINA, ARGENTINA, SHOWING WAREHOUSE, STORE AND DWELLINGS. STOCKPILE IN BACKGROUND

ment in copper is approximately 400 ft. below surface. The silver values fluctuate in the same sense but to a lesser extent than those of copper. The gold is fairly constant and may be constituent of the quartz gangue. There is a tendency to enrichment at wide vertical chimneys. At the lowest level the values are about 6 per cent copper, 5 dwt. gold, and 1 oz. silver.

The Upulungus vein lies south of and nearly coextensive with the San Pedro, their strikes converging slightly toward the east. The veins dip toward each other. The uppermost level on the Upulungus is at about the elevation of the deepest San Pedro level. The explored length of the Upulungus along the strike is over 2,000 ft. There are five levels at intervals of about 100 ft. along the dip of 73 deg. North. The total drift development is about 6,300 ft. with raises every 240 ft. Several adits connect to surface.

About 200 ft. above the uppermost formal working, and connected to the west end of the Upulungus by old native workings, is the Mellizas vein, which is doubtless the western prolongation of the Upulungus. No zone of secondary enrichment has been positively identified, as no sharp change in values is to be noted, but there is a tendency toward lower values and greater width with depth. An adit from No. 5 level leads to the loading yard at the cableway station. At this lowest level the values are roughly 2.5 per cent copper, 11 dwt. gold, and 6 oz. silver. The average vein width throughout the mine is 33 in. and the breaking width in the stopes is 45 in. With the high precious-metal content, such stripping of the walls is a wise precaution, but one suspects the motive when it is known that contractors have been paid by the ton, and that the walls drill and break more readily than the quartz vein.

Some work has been done on the Placillas vein where it cuts the east end of Upulungus. At various old adits the Placillas has been cut, but it has not been worked to any extent. This vein strikes southwest from the east end of the Upulungus, and it seems probable that it is identical with the Atacama vein on the south side of Mexicana gulch, the midway portion in the gulch being covered by a heavy filling of detritus from the not infrequent avalanches. The Atacama vein has been developed by two adit drifts for a length of 300 ft. The ore runs about 4 per cent copper, 7 dwt. gold, 4 oz. silver, and is 26 in. wide.

The Gibraltar, White, Anduesa, Verdiona, and Elsa veins have all been worked, but apparently no development was carried ahead of stoping, so no ore is at present blocked out.

Underhand Stoping Employed Thus Far

On all veins stoping has been underhand, but portions are prepared for shrinkage stopes with preparatory timber stulls. The scarcity and cost of timber will eventually cause a change from timber stulls to ore pillars, and either mining these pillars, re-treating or possibly abandoning them. On main haulageways the track gage is 60 cm.; on other levels it is 50 cm. The grades are from ½ to 1 per cent. Ore-bin capacity is about 240 tons. There is no working shaft in the district, as the Mexicana gulch supplies the readiest point of attack to all veins by means of adit crosscuts and drifts.

Labor is low-priced but expensive, the production being less than three-fourths of a ton per underground shift. Material placed at the mines costs about 3 pesos for each ton of unsorted ore mined. Man-power only is used. The total cost of sorted ore placed at the smelter is about 14 pesos per ton.

The Smelter at Santa Florentina

The smelter has been recently overhauled. The present equipment includes 1,500-ton ore bins, 500-ton coal bins, two McDougall roadsters of 75 tons each, two blast furnaces, an 80-ft. reverberatory furnace of 150 tons' capacity, two copper converters, a coal pulverizing and distributing plant, and the necessary mechanical charging apparatus.

The power plant consists of Babcock & Wilcox boilers for an engine capacity of 300-hp., direct-connected Pelton wheels estimated to give 580 hp. at the line shaft, and waste-heat boilers utilizing reverberatory gases. These latter are installed on separate flues, their combined capacity being about 800 hp., but it is possible that they could not both be used to capacity at the same time. Under ordinary conditions it is possible that about 900 total horsepower would be available, of which 560 is needed at the smelter, the remainder to be transmitted to the mines. The proposed transmission line is about thirty kilometers long, using 25-ft. poplar poles spaced 195 ft. and carrying a three-phase circuit at 13,500 v., besides telephone wires.

Under proper supervision the smelting should cost about 15 pesos per ton of sorted ore and recover in the bullion 85 per cent of the metal.

Total overhead charges for all operations in Argentina are about 3.50 pesos per ton. Marketing and refining cost about $82 United States currency per ton of bullion. At normal exchange of 2.30 pesos per dollar, the above costs determine a low limit of mined ore when the contained minerals are worth $17 United States currency per ton. When exchange is around 3 pesos per dollar, as during the early part of 1921, $14 United States currency is the low limit.

The present condition of exchange has resulted in one oddity not generally commented upon. There now occurs the anomaly, practically unknown elsewhere, of United States paper money commanding a 13 per cent premium over United States gold coins. This ratio has existed for some time and is due to the prohibition of the export of gold from Argentina. Departing passengers are allowed to take with them only $500 United States currency in gold coin each, on which they make a profit of about $65. There is very little gold on the general market in Argentina, but plenty in the government treasury, which is accumulating a large reserve to cover its paper issues. Undoubtedly in the aggregate a considerable amount of gold is smuggled out, but it must be in such separate driblets as not to alarm the treasury officers.

Operations in Los Bayos, Caldera and Cerro Negro

The veins principally worked in the Los Bayos district are the Los Bayos, Desamparados, San Pedro, Confianza, Irlandesa, San Miguel, and Aida. The Los Bayos mine, after considerable development and sale of ores, finally built a concentrator two miles down the Oro gulch and a cableway to connect mine and mill. The concentrates came back over the same cableway and were sent by pack trains to the government cableway for shipment to the smelter. Operation of the concentrator is said to have been stopped by court injunction against fouling the waters of Oro gulch, as they eventually reach the water supply of the town of Chilecito. None of the mines is now working.

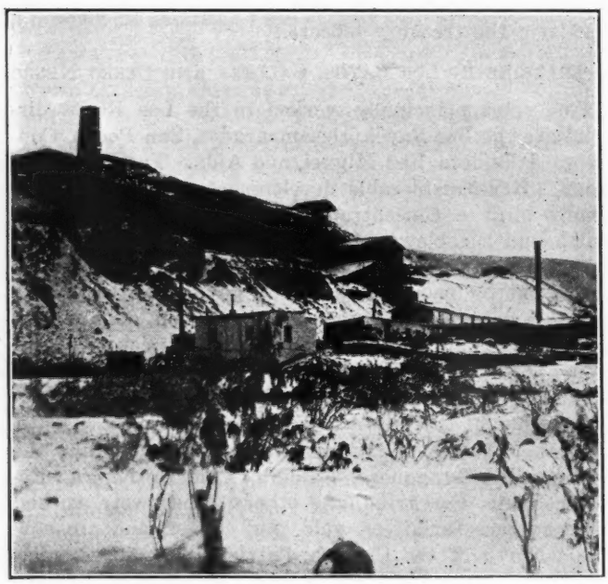
In the Caldera and Cerro Negro districts occur the veins called Aragonesa, Caldera, Caldera Nueva, Espíritu Santo, Peregrina, and others. They were worked from surface for silver, gold, and copper, and are now idle. North of the Caldera district about three miles lies the Encrucijada mine, where a small blast furnace was once operated but on too small a scale of operations for economy. Four miles further north along the contact is the San Juan mine, which has maintained operations for many years on a rather small scale. The copper ore is sent down to Totoral, seven miles by pack train, and there subjected to a chloridizing roast before leaching.

Placers Long Worked at Corrales

Seven miles northwest of the town of Famatina is Corrales, a district of gold placer mining. This is at the confluence of the Achavil, Marco, and Amarillo rivers, all draining the Famatina Range. Gold has been washed from these gravels since the first European expeditions to this district, when the country pertained to the viceroy of Lima, and is being recovered today. These are typical one-man operations. A man or a family can make a good living, but only so long as no hiring is done. Several companies have attempted the work, with disastrous results. Only a few years ago a modern dredge was transported at immense cost and installed here. Today it would be hard to find a piece of the equipment. The simple explanation is that high-grading is the accepted prerogative of the placer worker, and every hired man reduces the opportunity for profit. The local inhabitants naturally welcome any enterprise which gives them a chance to get a wage in addition to the gold they recover.

In the provinces of La Rioja, Catamarca, Cordoba, and San Luis there are deposits of merchantable mica. It occurs in pegmatite dikes, nearly vertical in the surrounding schist, the so-called veins varying in width from that of a knifeblade to several yards. The quality is that of stained block, and blocks up to a square yard in surface and several inches thick have been mined. During the war the mining of mica received a great impetus, and many poorly advised concerns went "broke." Those who have stayed in the game and continue to make a profit have not been blessed so much by having any remarkably better deposits to exploit, but owe their prosperity to their more honest business methods and consequent better reputation for reliability.

The current prices for trimmed mica in Buenos Aires are about one-sixth of those quoted in the *Engineering and Mining Journal*. The reason for this is manifold.



SMELTER OF FAMATINA MINING CO. AT SANTA FLORENTINA, ARGENTINE

The dealers feel obliged to reclassify all mica as to grade and size in order to be sure that their deliveries will be accepted, and this reclassification costs money. Then there is a fairly close agreement among dealers as to what they will pay, this agreement amounting at present to a virtual monopoly. Although the export duty on mica from Argentina is negligible, the import duty into the United States is about 30 per cent *ad valorem*. Properties of fair possibilities are easy to acquire, and there is an open field for concerns which can handle their product direct to the United States or Europe without the intervention of various dealers and commission men.

In the Province of Jujuy and at possibly other parts of the republic there are lead mines and prospects. The good territory for metallic minerals has been little prospected in Argentina. In the southern provinces are beds of coal sufficiently good to cause the newspapers of the country repeatedly to urge the government to adopt some settled policy regarding the coal fields and their exploitation. They ask government aid because it is hard to interest private capital in ventures which pay less than 25 or 30 per cent per year on the investment, this being the return on the cattle industry, which supplies the criterion for other lines of business that have been established in Argentina.

Some fine asbestos specimens with fibers 14 to 18 in. long have been brought in from the Province of Mendoza, near the Chilean border.

Along the Atlantic coast south of Buenos Aires and about half way to Cape Horn are the Rivadavia oil fields. These were explored by government geologists, and the district was largely reserved for naval use by the government. Recently others have entered adjoining fields, notable among the new-comers being a company associated with large Argentine railway interests which look forward to the use of oil on their locomotives.

Climate Dry in Mining Regions

With the exception of the *pampa*, which corresponds to our western plains and comprises most of the immense republic of Argentina, and of the foothills of the Andes devoted to agriculture, the country is a mountainous desert. In the Andes the annual precipitation is about 10 in., and the altitude prevents the growth of any vegetation except a low mossy grass. In the foothills at 7,000 ft. there is a fog belt, and here are occasional small shrubs. Through the valley from Famatina to Chilecito the annual rainfall is about 5 in., and the only vegetation worth mentioning on this delta terrain is due to irrigation. The mountain streams become lost underground before proceeding far across these deltas, so any irrigation water has to be caught before the streams strike the deltas.

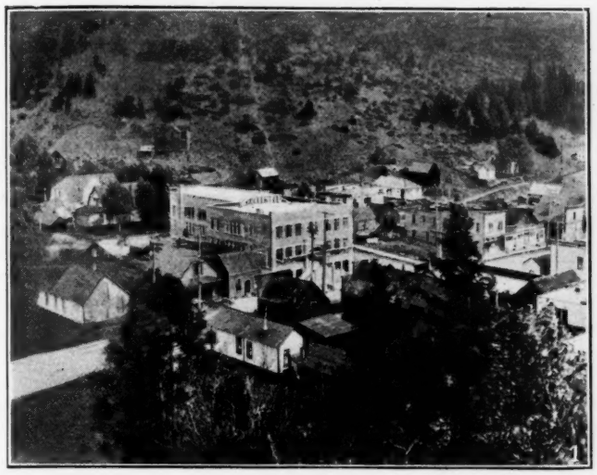
In parts of the country at 3,500 ft. altitude there has been a decided change during the last seventy-five years in either the precipitation or the drainage. A noticeable evidence of this change is at Capayan, about five kilometers east of and midway between Chilecito and Famatina. Here sixty years ago was a smelter handling the Mexicana ores, and there was a thriving farming community. The smelter ruins, the old slag piles, and marks of cultivation still exist. The surface flow of water stopped, and the inhabitants and industries were obliged to move where water was to be had. Darwin's figure of one inch per year for the rate of rise of the Andean mountains could easily explain a diversion of watercourses by the formation of a 4-ft. barrier in fifty years. Where two generations ago the soil produced wheat, corn, barley, grapes and other fruit, there is now only sufficient vegetation to support an occasional armadillo or an ostrich.

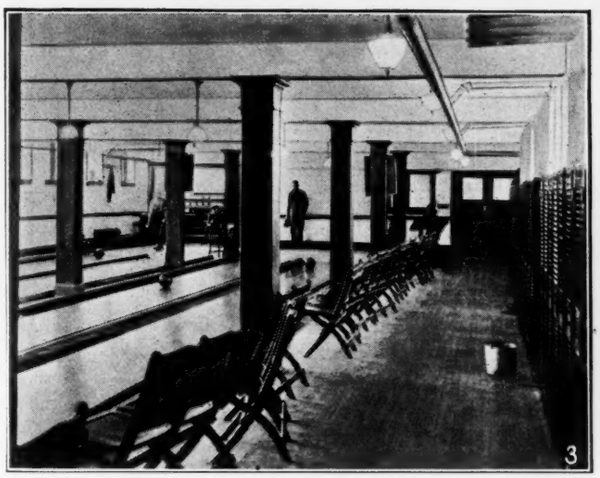
Production of Bauxite Declined in 1920

According to the U. S. Geological Survey, 521,308 long tons of bauxite was produced in the United States in 1920, valued at $3,247,345, as compared with 376,566 long tons, valued at $2,201,747, in 1919. The mines in Saline and Pulaski counties, Arkansas, produced 431,279 long tons, or 92 per cent of the total output in 1920. The production from these mines in 1919 was 333,490 long tons.

Georgia ranked second, Alabama third, and Tennessee fourth in production, and the combined output of these three states was 40,029 long tons in 1920, as compared with 43,076 long tons in 1919. In Georgia the bauxite-producing counties, arranged in order of quantity produced, were Sumter, Wilkinson, Floyd, Randolph, Meriwether, Macon, and Bartow. A number of the mines in Bartow and Wilkinson counties that were worked in former years have been abandoned, but new deposits in Randolph County were opened in 1920.

The bauxite imported in 1920, most of it from South America and France, amounted to 42,895 long tons.





1—MORNING CLUB BUILDING AND SECTION OF MULLAN, IDAHO. 2—BILLIARD AND CARD ROOM, MORNING CLUB. 3—BOWLING ALLEYS, MORNING CLUB. 4—A CORNER OF THE READING ROOM, MORNING CLUB.

Welfare Work in the Coeur d'Alenes

Extensive Outlay for Improvement of Social Conditions by Two Largest Mining Concerns—Value of Effort Demonstrated—Kellogg and Its "Y"—New "Morning Club" a Model of Its Kind

By Hilliard W. Power
Written for *Engineering and Mining Journal*

NOTEWORTHY RESULTS in welfare work have been achieved by certain mining companies operating in the Cœur d'Alenes, in northern Idaho, even though the necessity for such work does not exist here to the same degree as in less fortunately situated and more isolated districts. The Cœur d'Alenes are exceptionally favored as to climate, possessing neither extreme heat nor cold, wetness nor dryness. The district is traversed from end to end by one of the finest auto highways of the United States, and can be reached by rail within a few hours from such centers as Spokane, Missoula, and Butte. The population is sufficient to afford the best educational facilities, and the district as a whole possesses residential advantages rarely found in a section where mining operations constitute the main industry. The two chief towns, Kellogg and Wallace, have substantial business blocks and modern paved streets, as well as other facilities that make life in larger cities so desirable to many. Another important town, Mullan, possesses a beauty of location not enjoyed by the others. Burke and Wardner alone retain the picturesque aspect of the early-day mining camps.

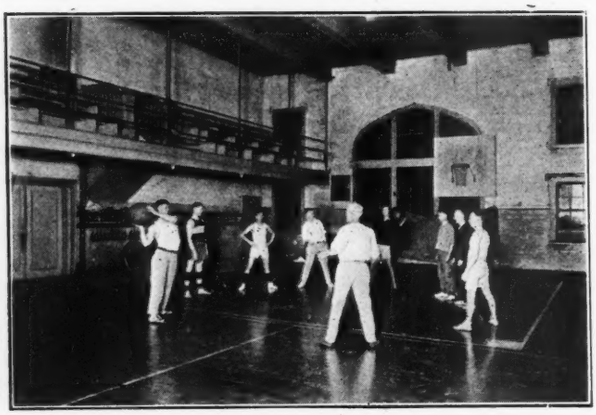
Although such advantages make mining community welfare work to a certain extent unnecessary on the part of the corporations directly concerned, efforts to improve working and general community conditions have been made by two of the largest operators of the district. These are the Bunker Hill & Sullivan Mining & Concentrating Co., at Kellogg, and the Federal Mining & Smelting Co., at Mullan, which at present are employing upward of 1,200 and 700 men, respectively.

No effort has at any time been made by either of these two companies to establish company or "closed"

towns. But the methods adopted by them differ markedly. Bunker Hill became interested in welfare work over ten years ago; the Federal at a much later date. The latter expended in one allotment over $100,000 for a club building and equipment, itself undertaking all subsequent supervision; the former increased its expenditures by degrees, as if experimenting, but at the same time left details of management and supervision to a national and state organization having no connection with the corporation.

Kellogg, because of recent growth, threatening to rival Wallace, the county seat, as the largest town of the Cœur d'Alenes, has been built up almost entirely because of Bunker Hill's activities. Adjoining it is Wardner, born about 1884 because of preliminary, and now historic, operations up Milo Creek. With the completion of Bunker Hill's great bore, the Kellogg tunnel, just west of Kellogg (and which until then possessed no distinction save as a railway passenger station and freight and ore transfer point), the business life and activity of Wardner, as if by common impulse, moved down the gulch and settled at Kellogg.

Among the fraternal and social organizations involved in this wholesale migration was the "Improvement Club," given over chiefly to cultivation of a good time along intellectual lines. In looking for some means of investing Bunker Hill money in the building up of a model mining community, F. W. Bradley, president, and Stanly A. Easton, general manager, extended an invitation to the Idaho State Y. M. C. A. officials to assist in the establishment of a "Y" at Kellogg. That was over ten years ago. The Y. M. C. A. men stepped into the field, and annexed the late Wardner "Improvement Club," using it as a nucleus for their local organization. The understanding was that the mining company would provide the necessary accommodation for a thoroughly modern Y. M. C. A. and take care of other expenditures where ordinary membership fees were not sufficient for maintenance. Kellogg citizens provided the site for the building through popular sub-



GYMNASIUM, KELLOGG Y. M. C. A., KELLOGG, IDAHO

scription. The institution has therefore, appropriately enough, become triangular in its scope, with a national organization, local residents, and the mining company as the three sides of the triangle. All interested testify to the admirable way in which the scheme has worked out. The tenth anniversary of the club's establishment was formally celebrated last February.

The building, a handsome brick structure, faces the main business street of Kellogg. The initial outlay for construction was $35,000, and $10,000 more was invested in furniture and equipment. There are three stories. The two lower floors are used exclusively by the Y. M. C. A. On the main floor is a reading room, a circulating library with 1,200 volumes, the secretary's office, administration offices, and class rooms. On the lower floor are baths, showers, a plunge, bowling alleys, auditorium, and gymnasium. A Y. M. C. A. secretary and assistants are in charge. The upper floor of the

READING ROOM, KELLOGG Y. M. C. A.

building contains lodge and banquet rooms, the use of which is subject to direct supervision of the Bunker Hill company. The corporation takes care of all ordinary overhead charges, as far as the building is concerned, together with maintenance, and provides each year for additions or renewals. Expenditures on extension and new equipment last year amounted to $7,373.12.

Nearly every Kellogg business and professional man, as well as Bunker Hill technical and executive men, hold Y. M. C. A. membership tickets. But with a paid membership of over 400, it is evident the dues would fall far short of taking care of running expenses, considering the scale on which the institution is conducted. All matters are left in the hands of committees, just as in similar institutions elsewhere, nor does the company seek to influence in any way the choice of committees or matters of policy. But one requirement was laid down in the beginning, and that was maintenance of the institution along regulation Y. M. C. A. lines.

Membership is not required of those availing themselves of the advantages of the Kellogg "Y." Those who maintain membership do so more from a sense of civic pride and a sense of appreciation than because of necessity.

Undoubtedly the Bunker Hill company's expenditures on this work have proved a profitable investment. Its influence is noted in the comparative freedom the company has enjoyed from serious labor troubles. Within the last year, and following the tendency of the price of lead to seek a corner in the basement, two sharp cuts in wages have been made, and nothing has been heard in the nature of complaints about capital grinding down the laboring man. Labor radicals, so common and troublesome at times elsewhere, create no interest in Kellogg. Outside agitators, armed with I. W. W. and similar destructive economic doctrines, are allowed every freedom provided by the Constitution, but invariably bump up against a stone wall of absolute

indifference when they try to start trouble in Kellogg or among Bunker Hill's employees. And there is nothing that will break an agitator's heart so quickly as cold, stony indifference. Of course, this community welfare work is but one factor, but the Bunker Hill company has an enviable record for loyalty and length of service of employees, and of a high degree of efficiency in all departments of its organization.

Federal Company's Methods Different

Radically different methods have been adopted by the Federal Mining & Smelting Co. in undertaking a similar achievement at Mullan. The scope is more pretentious, expenditures have been larger, and more direct supervision is exercised over the enterprise. In this institution the company not only provides all the money necessary for the building and equipment of what is probably one of the most luxurious "workingmen's clubs" in the country, but does not permit any individual or organization to assist in its maintenance. This project has appropriately been named the "Morning Club," after the Morning mine, itself located at Mullan, and representing the chief activity of the Federal Mining & Smelting Co.

This institution has no dues. Primarily intended for the use of company employees and their families, its hospitality and advantages are extended to all residents of Mullan on equal terms, as well as to the casual visitor.

The club building is a three-story red brick structure, conveniently situated. It is presided over by a manager and assistants, who devote full time to the work. There is also a ladies' department, and no facilities are provided for the men that the opposite sex does not share.

The building is 50 x 100 ft. in dimensions. On the main floor are the library and reading rooms, a lounging room for men, and a ladies' parlor, as well as the office, a canteen, and lockers for those using the gymnasium.

A large part of the building is taken up by the auditorium, 36 by 65 ft. in plan and two stories high. It has a seating capacity of about 500 and is so arranged as to be available for entertainments of various kinds as well as for motion picture shows. When not required for social affairs, the auditorium is in demand for basket ball, indoor baseball, and similar sports. An orchestra and band have been organized.

On the top floor a large banquet room has been provided. This room is also used for dancing and is a popular place for card parties or table games of various sorts, so that it is much in demand by various town organizations. Adjoining it is an electrically equipped kitchen and pantry.

Much of the space on the second floor is devoted to educational work, and here at certain times each evening may be found Jan Okusklies and Ole Larson endeavoring to improve their knowledge of the English language. Public and high school teachers of Mullan assist in the educational work. Other classes deal with subjects intended to help the mine workers advance in general and technical education. English, naturalization, applied mechanics and drawing are the chief subjects taught.

There are bowling alleys on the lower floor, where contests are held between members of an eight-team league, representative of the various interests of the town and of the Morning mine. Billiard and card rooms are also on the lower floor.

Many of the miners felt a little backward at first about availing themselves of the advantages of the club. They could hardly understand it. Soon after the formal opening, a group of muckers, after coming off shift one day, decided to put on their best and look the institution over. Getting as far as the lobby, they twisted their heads around to see what they could, evidently being somewhat afraid to move. One of them edged toward the main entrance. "Hey, where you goin'?" inquired a companion. "Goin'?" he replied. "I'm goin' home; that's what I'm goin' to do. This layout's too —— swell fer us!"

Happily, they have got over feeling that way by now, and there is hardly a man among the Morning's big crew who does not know of some way of getting personal enjoyment out of the Morning Club. Since it was opened a few months ago, its functions have been expanding and its usefulness has been increasing.

Ontario's Nickel-Copper Industry Quiet In First Half of Year

Both the International Nickel Co. of Canada and the Mond Nickel Co. are operating on a greatly reduced scale from that of the war period. No shipments of nickel-copper matte were made during the first quarter of 1921 by the Mond company to its refinery in Wales, according to the Ontario Department of Mines. Surplus stocks of nickel are gradually being absorbed. The British America Nickel Corporation shut down its smelter on Feb. 26. A reorganization of the company is probable before work will be resumed. Meantime a small force has been doing some underground development work at the Murray mine. During the period 153,387 tons of ore was smelted and 7,568 tons of Bessemer matte produced. The latter contained 3,861 tons of nickel and 2,315 tons of copper. Of the total matte product 3,367 tons was shipped to Canadian refineries at Port Colborne and Deschenes, and 896 tons to the United States. The two refineries treated 2,554 tons of matte for a recovery of 2,853,512 lb. of nickel and 1,562,150 lb. of blister and ingot copper. The average New York price for electrolytic copper was 12.66c. per lb. for the first quarter of 1921, as compared with 18.93c. in 1920.

Advisable Precautions in Reopening Flooded Mines*

There is no assurance that methane will always be encountered in dewatering or recovering long-flooded caved shafts and mines, but in such work it is advisable to take reasonable precautions at all times. Ample air circulation should be provided, and, in general, this can be obtained only by use of mechanical ventilation equipment such as fans, tubing and complementary equipment. When necessary to explore recovered timbered territory which has been under water a number of years, it is advisable to use an approved type of coal miners' safety lamp to test for explosive gas, and if it is found to be present, not only should ventilation be supplied, but the workers should use only the best types of electric safety lamps until it is certain that precautions have been taken against all explosive gas or until such gas has been wholly removed.

*From U. S. Bureau of Mines, *Reports of Investigations*, "An Unusual Hazard in Reopening Long-Flooded Timbered Metal Mines," by D. Harrington.

By The Way

A Snake Story

G. G. Dobbs, mine superintendent for the Tata Iron & Steel Co., of India, tells the following story:

"The Tata steel plant band was giving a concert from the club house veranda at Jamshedpur and during the concert a large audience was sitting on chairs on the lawn enjoying the music. Near the front of the audience a young American engineer was sipping a '*chota* peg' (whisky and soda) and on reaching down to put his glass on the grass beside his chair, his hand touched something cold and clammy. On glancing down he saw the tail of a snake protruding from his trousers leg, a snake which had just crawled up. Letting out a frantic howl he jumped to his feet and the amazed audience were electrified to see him reach down and with one fell swoop rip his trousers from his body. Then, attired lightly in a B.V.D. outfit, he raced across the lawn and into the club house. Inside the club house he dashed into a room and proceeded to examine his legs for snake bite, much to the interest and consternation of three elderly ladies who happened to be occupying the room at the same time. However, all ended well and no fatality resulted, and, although the young man is still being jollied, he looks happy."

There are many snakes in India and perhaps almost as many stories about them. Snakes, of course, are very fond of milk, which fact lends color to another version of Mr. Dobbs' anecdote. According to this, it was a young cobra that elected to explore the young man's trousers. Quickly grasping the situation, our hero poured the glass of milk that he had been about to drink into a saucer and placed it on the ground, whistling as he did so. Down slid the cobra without delay, making for the milk, where he was promptly dispatched. This version, we think, is much to be preferred for parlor entertainment. The substitution of milk for a *chota* peg and the retention by the young man of his trousers *in situ* are decided improvements. He also kept his composure as well as his trousers, which makes him look more like a hero than ever, or so we think.

We Wonder

Mr. Kreuzpointner's recent article on "The Fatigue of Metals" makes us wonder if copper won't get tired of being in the cellar after a while.

Pennsylvania or Bust

In these days, while domestic silver still enjoys the benefit of the Pittman Act, foreign mines must wait their turn. And just now the wild and woolly West may tremble; for there comes a dispatch from Kinzua, Pa., to the effect that a stampede of horny-handed prospectors is daily expected, trudging along with their mule-loads of all the little conveniences required by men of their humble calling. In due time decrepit Fords may arrive from points more distant than the mine-and-smelter supply centers of Warren County. Kinzua, noted for lumbering and consumption of hard licker, is experiencing the symptoms of a silver-mine boom. Some mysterious strangers have visited a hardware store at Warren, Pa., making inquiries as to the construction of a furnace to treat ore as per samples exhibited. It is reported that assays indicate the ore to be of high grade, with silver in commercial quantity. Old inhabitants are refreshing their memories as to legends that they heard in their childhood days, as the family sat about the fireplace during the long winter evenings. Many tales are current, of ancient mines where the Indians obtained silver to make wampum beads and an occasional god or two. One favored tribe held the secret of the richest mine, a treasure spot rivaling those of the Incas or of Montezuma. Some frightful cataclysm or ordinary landslide closed the entrance and entombed the primitive miners. May we not hope that the recent discovery is that one best bet? Ho! Ye idle consulting engineers of the dark cañons of Wall Street and vicinity. Pack up your hammers and your sample bags, and smile.

Judging by Appearances

"With h'election commin' on, m'son," said Cap'n Dick, "remin's me o' one time in Colorado w'en Benjamin h'Eaton wuz runnin' for Governor o' tha state. Coorse 'ee 'ad to gaw roun' makin' speeches an' shakin' 'ands with the voters, an' 'is manager made h'arrangements for one o' these 'ere big rallys at Central City. Mister h'Eaton wuz a large red-faced chap an' 'ad no trouble makin' friends anyw'ere. H'after tha speech-makin' wuz h'over tha 'ol crowd gaws to one o' tha pubs, w'ere a lot o' tha boys 'oo 'ad jus' come h'off shif' wuz too. Walkin' h'up to tha bar tha manager sez, 'Ere boys commes on an' 'ave somethin', an' shake 'ands with tha Governor, Ben h'Eaton.' 'Been h'eatin," sez Jimmy Treloor, 'W'y, dam-me, m'son, 'ee look to me like 'ee been drinkin'."

The Deserted Mining Camp

W. O. Clough

Deep in the silence of a mountain vale there lies,
Forgotten and forlorn, a mining camp,
Where once the voice and toil of men were known—
Of men who mined and undermined and delved
And burrowed and dug for precious ores within
The mountain sides. But now no sound is there
Save winds, and birds and beasts that, bold become,
Make home where fear of men had once proscribed.
The one-time streets are grassy lanes today.
The buildings, few and ever fewer, lean
This way and that, scarce struggling now
Against the certain ruin. And on the breath
Of winter winds there shriek the ancient ghosts
Of yesteryear. They wail and moan about
The shattered window frames. Adown the shafts
Of mines long since forgot, they peek and peer
And mock the echoes there. And shrill and high
The winds seem to deride the works of man:

"A-ha and O-ho, little man, so you thought to wrest
From the bosom of earth the secrets hidden there.
You dreamed of conquering the everlasting hills.
Where now your victory—your petty gain?
The lofty peaks scarce felt your feeble scratching
Toil upon their sides. The mighty forest
Was hardly stirred at your advent; the vale
But briefly troubled at your shouts and blows.
A-ha and O-ho, Dame Nature's not to be
So easily won, her riddle solved so soon."

And so the snows of winter howl about.
And down the crumbling chimneys, drops of rain
Patter their scornful laughter in summer time.
And leaves and trees are whispering 'mong themselves
Sly, satiric thrusts at man's defeat.
And ever the winds deride and jeer and shriek
And howl and laugh, mocking vain dreams of men.

CONSULTATION

Imported vs. Domestic Kaolin

"As a constant reader of *Engineering and Mining Journal* I wish you would tell me something about the virtues of the kaolin that is found in the United States. Is it as good as the imported material and about how many localities produce it?"

Most of the china clay or kaolin used in this country is imported from England. In fact, the U. S. Bureau of Mines estimates that about fifty-six per cent of the kaolin consumed in the United States is foreign material. Domestic kaolin resources have never been thoroughly investigated, although this country is reported to contain more white clay than any other. The English china-clay reserves have been heavily depleted, and English potters have attempted to persuade the British government to prohibit the exportation of china clay so that it might be conserved for home use. This circumstance, coupled with the difficulty American potters had during the war in obtaining foreign clay, has led to a more intensive search for a good grade of clay in the United States and has stimulated interest in the subject.

The ceramic station of the U. S. Bureau of Mines at Columbus, Ohio, has undertaken the investigation of the white clays east of the Mississippi River, in order to determine their physical characteristics and to develop better methods of blending and refining. It has been felt in the trade that one important reason for the superiority of imported clay is the more careful treatment and washing given the product and a better general foreign understanding of the technology of clay production and use. According to a recent report of the Bureau, the physical properties of 100 clay samples have been determined and an improved method of clay refining worked out, by means of which the fine grit and most of the objectionable impurities can be removed. Pottery has been made from some of the domestic clay which appears to be equal to that made from imported material.

The production of kaolin, the purest form of clay, is principally confined to the Southern States, although California, Colorado, and Nevada also have produced this material. North Carolina, Virginia, Georgia, Delaware, Indiana, Maryland, Mississippi, Missouri, and Vermont are the chief producing states.

During the war and under the auspices of the Government, Messrs. Bleininger and Ries issued a report on the examination and sampling of clay deposits, in order to stimulate a systematic research for ceramic raw materials in the United States. A copy of this report will be found in "Clay-Working Industries, Silica Brick, and Building Operations in the Larger Cities in 1918" by Jefferson Middleton, issued by the U. S. Geological Survey. Miners and users of clay will find much of interest in this report, which points out that the location, workability, extent and thickness of deposit, visible impurities affecting commercial value, and facilities for purification are important matters to be considered in the prospective operation of any clay mine. Briefly, a good clay deposit should not be located more than six miles from transportation lines, overburden must not be too heavy in proportion to the thickness of the deposit (provided it is to be worked by open-cut methods), and impurities affecting commercial value, such as sand, concretions of limonite, siderite, pyrite, calcite, gypsum, and chert, should be looked for. Most impurities can be eliminated by washing, but to be of commercial value, the clay should contain at least fifteen per cent of refined product if it is of white-burning character. Water supplies are necessary if washing is to be used. The deposit should be carefully sampled and its uniformity ascertained.

It has been found that for some requirements, such as the coating of high-grade papers, clay fillers for paints, and clay for oilcloth, imported clay is superior to domestic. The production of kaolin, paper and ball clay for 1919 is estimated by the U. S. Geological Survey to have been about 280,000 tons, whereas imports for the same period amounted to 180,600 tons, a figure which includes the kaolin and paper and ball clay imported. Imports were little more than half the 1914 rate. Persons having a domestic kaolin deposit will do well to get in touch with the work of the U. S. Bureau of Mines and the Bureau of Standards in the development of the domestic ceramic industry.

Conductivity Standard of Copper

"What is the standard used for measuring the conductivity of copper? Is copper's conductivity compared with silver, and how is it that copper conductivity is sometimes rated as being more than 100 per cent?"

The conductivity of a lot of copper is usually referred to a standard adopted by the International Electrotechnical Commission in 1913, which specified a standard value for the electrical resistivity of annealed copper as 0.15328 ohm at 20 deg. C., for a piece one meter long and one gram in weight. This value is based upon the average values obtained by the various national physical laboratories for ordinary high-grade commercial refined copper in the annealed state.

The Bureau of Standards has investigated the conductivity of commercial copper and has found that even in the purest grades of copper the variation in purity and physical state are sufficient to cause variations in resistance of annealed samples of about plus or minus 1.5 per cent from its own average resistivity given as 0.15292 ohm and determined from tests of eighty-nine specimens. Considering these variations, it is not surprising that copper is found running over 100 per cent in conductivity when referred to either of the above values.

According to the American Society for Testing Materials, electrical conductivity was formerly expressed as a percentage on the basis of a determination made by Matthiessen, about 1865, of the electric resistance of supposedly pure copper. Standard specifications for copper may sometimes refer to a resistivity unit above which copper purchased must not go.

HANDY KNOWLEDGE

Inverted Siphon Tap for Matte Settler

By JULIUS H. GILLIS

Written for *Engineering and Mining Journal*

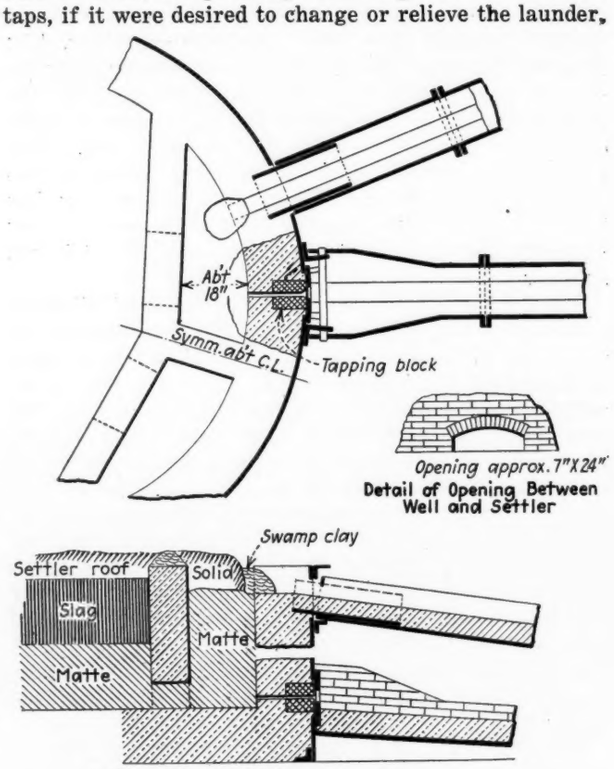
In starting the operation of the copper-nickel smelter of the British America Nickel Corporation near Sudbury, Ont., it soon became evident that the handling of the large flow of low-grade matte was to become a serious problem. The copper-nickel content of the matte averaged slightly over 10 per cent. It is very corrosive, and the large quantities to be handled made the problem especially difficult. As many as twenty-five taps in twenty-four hours from one settler were common practice, and the mechanical and chemical action on the tap hole were accelerated on account of the front of the settler being kept so hot by the continual tapping.

Four tap holes were provided, but they were close together, and although the destructive action of the matte was divided among these holes, they did not give much relief from the heat. In fact, by the better distribution of the heat, they may have made conditions somewhat worse and caused the whole front wall to tend to disintegrate. This would partly explain the frequency with which breakouts occurred around the tapping blocks when the block itself was still apparently sound.

Various arrangements of the tap hole were tried, and the most satisfactory seemed to be with it in the center of a chrome or magnesite tapping block about 8 in. square, the block extending about 10 in. into the settler wall. The block was held in place on the outside with a heavy removable cast-iron plate. This plate had a hole about 5 in. in diameter concentric with the hole in the tapping block. The plate was used simply to hold the block in place, the matte being stopped in the block itself. The cast-iron plate was wedged rigidly to the front of the settler, and various arrangements of air and water pipes were tried to keep it cool, but these were generally found to be of little use.

When the hole in the tapping block became so large as to become dangerous, the cast-iron plate was removed and the tapping block gradually chipped away, being kept cool by a stream of air blown against it. When enough had been removed, the new block was inserted, the cast-iron plate replaced and the tap hole opened up with oxygen.

Although this arrangement was fairly satisfactory, or would have been under ordinary conditions, it was still difficult to keep the settler in working order, and after some disastrous runaways I obtained permission to install what we called the siphon tap. This is shown in the accompanying drawing, and, although the idea is not new,[1] it illustrates an interesting and successful application. The principle on which it works is quite clear from the drawing. Two siphons were installed in each settler and two of the four tap holes omitted. The matte was forced under the arch, and would rise in the well nearly to the level of the slag in the settler. When it was desired to tap, the clay in the overflow was broken away and the slag overflow stopped, and the matte was forced out at about the rate at which the combined slag and matte flowed in from the furnace spout. When sufficient matte had been tapped, the slag overflow was opened, the matte almost stopping of its own accord. A chunk of swamp clay was then dropped in and tamped down. Trouble was seldom experienced in starting the flow, even though no tap had been made for twenty-four hours previously. In case of a freeze-up owing to a long interval between taps, if it were desired to change or relieve the launder, it was always easy to open up the tap hole with oxygen, and after one or two taps the well was sufficiently heated so that there was no trouble in opening the overflow.



ARRANGEMENT OF INVERTED SIPHON FOR TAPPING MATTE SETTLER

Ordinary swamp clay was used for stopping the matte flow, and although much of it was required, it was cheap, being available at the plant in unlimited quantities. By no means the least of the advantages of the siphon was that any helper around the furnace could operate it. If the regular tapper was absent, the helper would generally carry on the work, using the siphons exclusively.

The ordinary practice was to use the siphons for most of the work, and take one tap per shift out of the tap hole so that it would be in condition to use should an emergency require the settler to be drained.

[1] Peters, "Practice of Copper Smelting." Pp. 136-137.

When the furnace was blown in, the opening under the arch was stopped with ordinary clay, and a bent bar inserted through the clay. This bar was withdrawn as soon as matte had accumulated to a sufficient depth to cover the arch. It is quite important to keep the slag out of the well, as it becomes sticky and will not flow freely. It is also much more difficult to burn out with oxygen in case of a freeze-up.

The walls of the well are of chrome brick, and originally were built with cooling pipes in them, with the intention of cooling with air, but this proved unnecessary and the air was soon shut off. The well always outlasted the campaign of the furnace, and it would be shut down for other reasons. After one settler had been in continuous use for about seven months, the longest campaign we had, one siphon was in perfect condition and the other would slag occasionally when the settler was nearly empty, indicating that there was probably some failure in the arch. The arched opening in the wall was made rather large, as it was thought that there would be less erosion on the soft hot bricks if the velocity of the flowing matte was kept low.

The launder was a half-round cast-iron trough, about 18 in. wide and in sections about 5 ft. long, connected in makeshift fashion to the settler. The launder proper was held against the outside of the settler and a smaller half-round section laid inside and projected about 8 in. into the settler wall. The whole was lined with magnesite and firebrick. Occasional break-outs would occur around the launder connection, but these were usually easily stopped. If they persisted, the slag overflow would be opened and perhaps the blast would be shut off the furnace a few minutes and a tap taken from the lower tap hole. This was in decided contrast with the procedure when there was a break-out around one of the lower tap holes and the 16 x 30-ft. settler started to empty itself.

Whether the siphon would be of practical use where conditions were such that the quantities handled were less, would, of course, have to be determined by trial, but for the conditions described it solved a serious problem. The element of time has much to do with the capacity of a matte tap hole. This is well demonstrated by the fact that a tapping block will last months when one or two taps are made per shift, but the same block will last hardly a day if used every hour.

A Cheap and Efficient Rod-Mill Lining

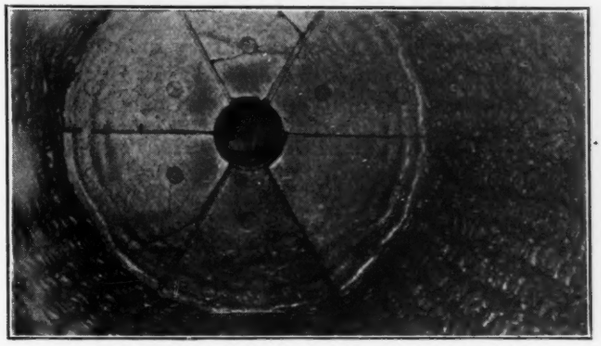
By M. S. Presler
Written for *Engineering and Mining Journal*

An improved form of lining for the rod mills at the C. O. D. concentrator at Kingman, Ariz., has recently been devised. The ore treated is hard and tough, containing 75 per cent silica, and the mineral is finely disseminated. As a result it is necessary to crush to 200 mesh.

To determine, among other things, what went on in the rod mills while working on this ore, the side manhole plate of one of the mills was removed. A great amount of slipping could be seen taking place with the rod load, the lining used being the smooth plate lining commonly used in rod mills.

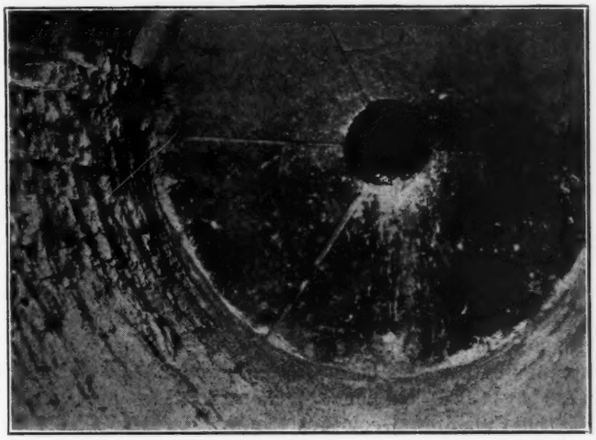
I then designed a lining, made up from 16-lb. rails and 1⅛-in. cruciform drill steel, cut up in pieces three inches long. The pieces of drill steel were heated red hot, then plunged in cold water, thus making them very hard. By marking the lengths of rails and drill steel every three inches with an Ox-Welding torch the pieces broke off easily. The pieces were cemented in the mill, end up, with a piece of drill steel between the web of each piece of rail, using a quick-setting cement.

The results have been very satisfactory. The smooth plate liners formerly used had lasted approximately sixty days, and the consumption of rods was three pounds per ton of ore ground. The new lining has been in the mill forty days, all indications pointing to a life



THE NEW LINING AFTER EIGHT DAYS' OPERATION

of twelve months or more, and the consumption of rods has been reduced to two pounds per ton of ore ground. The improved results are due to the fact that the rails, being soft steel, wear slightly below the pieces of drill steel; the butts of drill steel protruding, prevent the rod load from slipping and cause the rods to cascade properly. This was more noticeable after the mill had been in operation about three weeks.



A PART OF THE NEW LINING MADE OF CUT RAILS AND DRILL STEEL

The total cost in making up a set of this lining with new material is approximately 10 per cent below the manufacturer's price of cast lining. This is an ideal way to use up the odd lots of old rails and pieces of drill steel that accumulate around every mine.

To carry drinking water to stopes and other working places, water kegs are often used. A three-gallon oak keg is used for the purpose by the Carson Hill Gold Mining Co. at Carson Hill, Cal. An iron strap is formed to fit the keg. This is bolted at the top by a single bolt, and a double hook is also held by the bolt. By means of the hooks the keg can be hung from the edge of the skip and can thus be conveniently taken off at the levels. A handle is also attached to the keg.

THE PETROLEUM INDUSTRY

Oil-Bearing Rocks of Lower Mackenzie River Valley

Work of Canadian Geological Survey Indicates Excellent Possibilities in Oil Field Now Being Explored in Northwestern Canada

THE SUMMARY REPORT for 1920, Part B, of the Canadian Geological Survey, includes a report by E. M. Kindle and T. O. Bosworth on the "Oil-Bearing Rocks of Lower Mackenzie River Valley."

The district covered by the paper includes the valley of Mackenzie River, from the mouth of Great Bear River in latitude 64 deg. 54 min. and longitude 125 deg. 45 min. to a point a few miles below the site of old Fort Good Hope in latitude 67 deg. 30 min. These limits coincide with the disappearance of the Devonian rocks beneath a Tertiary basin on the south and a Cretaceous basin on the north.

The river route by way of the Athabasca or Peace river affords the only practicable means of reaching this region. The area covered by the report falls within the limits of two rather sharply contrasted physiographic provinces. The Mackenzie a few miles below Carcajou River passes out of a mountain province into a region bordered by a rolling plateau, where the maximum elevation of the lands adjacent to the river is generally between 200 and 700 ft. above it. The Mackenzie Valley from the southern margin of the plateau region above the head of the Ramparts to the mouth of Great Bear River is for 130 miles within the confines of the Rocky Mountains system, which, in this northeasterly region, is called the Mackenzie Mountains. In this area mountain topography alternates with basins floored with Tertiary and Cretaceous beds.

At two or three places in the Mackenzie Valley seepages of oil attracted the attention of explorers, and have long been known. Inland from the river other seepages were reported by the Indians. The tar springs of the Athabasca region were noted as early as 1789 by Sir Alexander Mackenzie. The first report of the Canadian Geological Survey on the Mackenzie Valley states that "the Devonian rocks throughout the Mackenzie Valley are nearly everywhere more or less petroliferous, and over large areas afford promising indications of the presence of oil in workable quantities." The remarkable character of the rocks, and the discovery of advantageous structures rather than the seepages, led one of the authors in 1914 to mark out certain areas as probable commercial oil fields.

Extending over a large area two thick and richly bituminous members exist within the Devonian. The lower of these is the Beavertail limestone, having a thickness of 300 to 400 ft. This limestone is more or less black with solid bituminous matter. It is thought that the bitumen is a fixed component of the limestone and not a variable constituent dependent on the migratory movements of the hydrocarbons in the rocks. In all the exposures of Beavertail limestone at present known the rock is bituminous. All, however, are on the crests or flanks of anticlines. No fluid oil was detected within these beds and no oil seepages emanate from them. All the way northward from Bear Mountain to Beavertail Point—a distance of 125 miles—this bituminous limestone is frequently conspicuous and presumably underlies a large area. The most accessible exposures of the Beavertail limestones are seen at the water's edge at Beavertail Point and near East Mountain and also in the river cliffs of Carcajou Mountain. This limestone is exposed on all the anticlinal mountains, and a few miles inland from the Long Reach along the southwest flank of Discovery Range it has an outcrop 100 miles in length. At depth under favorable structural conditions it is possible that some of the beds in this series may be found to hold accumulations of fluid oil.

It is evident from the geology of the region that the conditions conducive to the formation of oil fields are here very favorably fulfilled. Extending over a large area are 1,000 ft. or more of highly bituminous limestone and shales, from which an immense quantity of the petroleum might readily be generated. And overlying these beds are 2,000 or 3,000 ft. of clay shales and sandstones from which numerous seepages of oil arise. Finally, this mass of petroliferous deposits is traversed by large bold anticlinal folds. The high parts of anticlinal hills are not favorable for oil, since denudation has removed the oil-bearing formations from them. But these main anticlines pitch up and down and probably in some parts of the low flat land on the west side of the river, perhaps along the prolongation of these axes of folding, similar great arches of the petroliferous formations may be present underground. Such would be ideal situations for the accumulation of pools of oil. Away from the crests the dip slopes of the main anticlines present considerable possibilities; for changes in dip or porosity, faults, and minor flexures may result in the accumulation of many oil pools, at quite a distance from the main anticlinal axes. Apart from the large folds the minor undulations may also prove important. In such deposits as these it is probable in any case that oil accumulations will be formed. If large structures are not available the oil will find the small ones. These smaller structures, similar in dimensions, for instance, to the anticlines of the Oklahoma and Texas oil fields, probably occur throughout the territory, both on the dip-slopes and also at a distance from the axes of the main folds.

The discovery oil well is on the flank of one of the large anticlines eight miles distant from the crest. The location of this first test well was chosen in 1914, not as a spot where great production was hoped for, but as a site where a hole of moderate depth could not fail to penetrate the petroliferous formation which had been discovered.

The report is accompanied by a sketch map showing the geology along the Mackenzie River between the Ramparts and the Delta.

Book Reviews

Economic Aspects of Geology. By C. K. Leith. Cloth; 8½ x 5½; pp. 431; 13 figures. Henry Holt & Co., New York. Price, $5.

This is a book to which we can heartily recommend the geologist and the engineer, as well as the general reader; the former groups with the assurance that they will find in it an up-to-date discussion of the subject and a novel method of presentation, and the latter for their general broadening in education. This is not a textbook, nor yet a technical book: we have come to anticipate inevitably that books on economic geology will turn out to be treatises on ore deposits; but the title accurately states the field, which is surveyed briefly and lucidly and in all its phases. This is the only book which has ever attempted this, and the work is well handled, with great breadth of vision and with incisiveness.

The first chapter, an introductory one, surveys briefly the economic applications of the several branches of geology. The second treats of the common elements, minerals and rocks of the earth and their origin; the third, of the geology and classification of mineral deposits; the fourth, of the world's mineral resources, quantitatively considered; the fifth, of water as a mineral resource; the sixth of the common rocks and soils as mineral resources; the seventh, of the fertilizer group of minerals; the eighth, of the "energy resources"—coal, oil and gas; the ninth, of the "ferro-alloy" group of minerals; the tenth, of the copper, lead and zinc minerals; the eleventh, of the "precious metal" minerals; the twelfth, of miscellaneous non-metallic minerals; the thirteenth, of miscellaneous non-metallic minerals; the fourteenth, of exploration and development; the fifteenth, of valuation and taxation of mineral resources; the sixteenth, of laws relating to mineral resources; the seventeenth, of the conservation of mineral resources; the eighteenth, of the international aspects of mineral resources; the ninteenth, of "geology and man"; the twentieth, of geology and engineering construction; and the twenty-first, of the training, opportunities and ethics of the economic geologist.

This synopsis will show how broadly the author has viewed his subject, putting into the volume a greater horizon than has before been comprised in any one book. In a little over four hundred pages, it is evident that only the general aspects of each subject could be taken up, but all have been handled pithily and accurately.

Dr. Leith's conception of the field of economic geology is a broad one:

"In short, economic geology includes the consideration of man in reaction to his physical environment. There are some earth materials and some conditions of the earth environment which do not yet come wthin the field of economic geology. But so large a proportion of them do, that the 'complete economic geologist' should indeed be almost omniscient. When one considers what an insignificantly small portion of this field can be covered by any individual, it is apparent that the title of economic geologist implies no mastery of the entire field. There is yet no crowding" (p. 11).

Students of the development of thought on the origin of ores will be interested in Dr. Leith's opinion as to the origin of the Lake Superior copper ores, that they "were deposited by hot solutions related to the igneous rocks," since this has been by no means the generally accepted explanation.

Though a large part of the volume is necessarily an abridgment or compilation, as all general treatises must be, the general chapters cover phases many of which have not been before summarized; and the author's observations and communications are keen and sound. And he tersely expresses many things that we are familiar with but that will bear printing. "To any one familiar with the mineral field," he says (p. 329), "it is often surprising to see the rashness with which a conservative business man, who would not think of entering another industrial field without close study of all the factors in the situation, will invest in minerals without using ordinary methods of analysis of values."

Regarding apex litigation, Dr. Leith summarizes very effectively the argument to the geologist as a witness in apex cases (p. 354). Many will not agree with him, but his case is well put. Regarding conservation (p. 360), he truly states that "an initial step is obviously a careful taking of stock." But we are perhaps not yet quite ready to adopt the international standard as Dr. Leith appears to be, as a test of conservation, though we perhaps may find it necessary to do it gradually. Dr. Leith says on this (p. 363), "We might work out a program for the United States which would not be the best conservational plan for the world as a whole and which would ultimately react to the disadvantage of the United States. The wisest and most intelligent use of mineral resources seems to call unquestionably for their consideration in their world relations, rather than for a narrow interpretation of local requirements."

Altogether, a book you should read and have handy on your shelf.

J. E. S.

Limestones and Marls of North Carolina. By G. F. Loughlin, E. W. Berry, and J. S. Cushman; 7 x 10; pp. 211. North Carolina Geological and Economic Survey, Bull. 28; 3 figures, 17 plates (including maps). Raleigh, 1921.

The bulletin aims primarily to cover economic phases of the limestone and marl situation, the chief deposits having been mapped and described in previous publications. Part I covers the general properties of limestone, marl, dolomite, marble, and lime. The arrangement is somewhat confusing, as the texture, structure and weathering of limestone appear as subheadings under lime. Part II is devoted to the limestones of western North Carolina. They vary in geologic age from Archean to Cambrian, and are described geographically by counties. They lie in valleys and are mostly concealed beneath soil. Part III comprises a description of the limestone and marl deposits of eastern North Carolina. The marls are the more important. They are discussed from the standpoint of their geological age ranging from Upper Cretaceous to Pleistocene, and are described according to their geographic distribution.

The present and prospective commercial importance of North Carolina's marble and limestone industries is outlined in Part IV. The state's resources in these minerals are limited as compared with those of the surrounding states, with the exception of South Carolina, and there is no prospect of any decided increase in present activity. The most promising fields for expansion are in the production of crushed stone for road building, agricultural lime and limestone, and the manufacture of lime for building purposes, any marked increase in the latter industry being dependent to a considerable extent on the education of builders in the use of high magnesium lime, as the available limestones are chiefly dolomitic or highly magnesian.

The subjects are covered adequately, the treatment of their economic aspects being particularly noteworthy. The bulletin will no doubt be of great practical value to prospective producers, and should lead to a broader development of North Carolina's limestone resources. The publication was prepared in cooperation with the U. S. Geological Survey.

O. B.

Creative Chemistry. By Edwin E. Slosson. Cloth; 5½ x 8; pp. 311. The Century Co., New York. Price, $3.

Mr. Slosson is well known to magazine readers as an entertaining and instructive writer, but he is an authority on chemistry also, and so is particularly well fitted to write such a book as this. The text is in simple language which presupposes not even a knowledge of chemical symbols on the part of the reader, and the book is therefore not too technical for anyone. On the other hand, the trained engineer will not find the subject treated in so popular and superficial a manner as to be unenjoyable. The subjects of the chapters include Nitrogen; Feeding the Soil; Coal-Tar Colors; Synthetic Perfumes and Flavors; Cellulose; Synthetic Plastics; Rubber; Sugars; Corn Products; Vegetable Fats; Poison Gases; Electric-Furnace Products; and Metals. Many other interesting developments of chemistry are not included, but the list is well chosen. We can recommend this as an excellent book for the purpose for which it was written.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

A. I. M. E. To Hold Semi-Centennial at Wilkes-Barre Sept. 12 to 15

Varied and Interesting Program Arranged—Coal Mining Not the Only Subject To Be Discussed—Entertainment for the Ladies

The American Institute of Mining and Metallurgical Engineers will hold its 124th meeting at Wilkes-Barre, Pa., beginning Monday, Sept. 12, and ending Thursday, Sept. 15, 1921. Arrangements have been made to carry the meeting over to Friday in order to enable members to visit points not provided for by the schedule. This meeting will also be known as the 50th anniversary gathering of the A. I. M. E. Anthracite coal and its production will be the chief subject under discussion, and it is one of prime importance to every citizen of the eastern United States. The program is not limited to coal but also includes sessions on metals and geology at which other subjects will be discussed.

Headquarters will be maintained at Irem Temple, and the local committee requests that all members expecting to attend the institute meeting will correspond direct with the chairman of the Hotel Committee, Robert A. Quin. R. V. Norris is general chairman of Committee on Arrangements.

The program, subject to slight change, is scheduled as follows:

MONDAY, SEPT. 12

A.M.

Registration at Irem Temple.

2:30 P.M.

COAL

"Mechanical Mining of Anthracite," by H. D. Kynor.

"The Ashley Planes," by C. H. Stein.

"Anthracite Preparation," by D. C. Ashmead.

"Anthracoal," by Donald Markle.

"The Slush Problem," by John Griffen.

8:00 P.M.

"The Lynch Plant," by Howard N. Eavenson.

"General Description Anthracite Field," with maps and sections, by E. W. Parker.

8:00 P.M.

METAL SECTION

"Application in Rolling of Effects of Carbon, Phosphorus and Manganese on Mechanical Properties of Steel," by W. R. Webster.

"Thacher Process for Molding and Casting Propeller Blades and Wheels," by E. Touceda.

"Making a 5 Per Cent Nickel-Cast-Iron Alloy in an Electric Furnace," by D. N. Witman.

TUESDAY, SEPT. 13

A.M.

Automobile trip through Wyoming Valley, visiting breakers and mine plants. Leave Irem Temple 9 a.m. sharp.

LUNCH

As guests of the International Correspondence Schools, Scranton.

2:30 P.M.

TECHNICAL SESSION

In International Correspondence Schools auditorium.

Discussion on "Mine Fires," by Douglas Bunting.

"Electric Power a Factor in the Anthracite Field," by W. A. Thomas.

"Determination of Electrical Equipment for a Mine Hoist," by Graham Bright.

"The Automatic Substation for Coal Mines," by R. J. Wensley.

AMERICANIZATION SESSION

Meeting of Committee on Industrial Relations for Discussion of Papers. Discussion will be introduced by E. E. Bach, Director of Americanization for State of Pennsylvania, and chairman of institute subcommittee on Americanization.

Return to Wilkes-Barre by special train on Laurel Line.

8:00 P.M.

"The Hoisting Plant of the Pittsburgh Terminal Railroad-Coverdale Mine," by M. D. Kirk.

"Power Installation at Coverdale," by C. M. Means.

"Octagonal Ventilation Shaft of Davis-Daly Copper Co.," by J. L. Bruce.

"Application of Pulverized Coal to Boilers," by J. M. Fuller.

WEDNESDAY, SEPT. 14

9:00 A.M. and 2:30 P.M.

General joint meeting conducted by Society of Economic Geologists.

Papers of the Society of Economic Geologists and the following papers of the institute:

"Stratigraphy of the Anthracite Region." Discussion led by James F. Kemp.

"Petroliferous Rocks in the Sierra da Baliza," by E. P. de Oliveira.

"General Geology of Catorce Mining District," by C. L. Baker.

"Geology of the Namma Coal Field," by Edel Moldenke.

9:00 A.M.

SESSION ON MINE ACCOUNTING

"Capitalization and Valuation of Mine Development," by J. B. Dilworth. (Discussion.)

LUNCH

Complimentary to members and guests of the institute at the Wyoming Valley Shovel Works.

TECHNICAL SESSION 2:30 P.M.

"Queen Nine-hearth Roaster," by J. Moore Samuel.

"Flotation of Pyrite," by W. S. Morley.

"Relation of Gypsum Supplies to Mining," by D. H. Newland.

(Instead members may attend trips as arranged by the Ladies' Committee.)

8:00 P.M.

Dinner and ball at the Irem Temple, given to the visiting institute members by the Anthracite Section.

THURSDAY, SEPT. 15

All-day excursion by automobile, starting from Irem Temple at 9 a.m. Lunch en route.

ENTERTAINMENT OF LADIES

The ladies of the anthracite region are preparing for the entertainment of visiting ladies.

Tentative arrangements have been made for a tea Monday afternoon at the Wyoming Valley Country Club; Tuesday evening a meeting of the Woman's Auxiliary at Irem Temple. The ladies are invited to accompany the excursions of Sept. 13 and 15 and to attend the dinner and ball on Wednesday. In addition, visits will be made to the silk mills and numerous interesting points.

The detailed program of entertainment for ladies will be announced later.

Rossland Section C. I. M. M. Discusses Lead Smelting

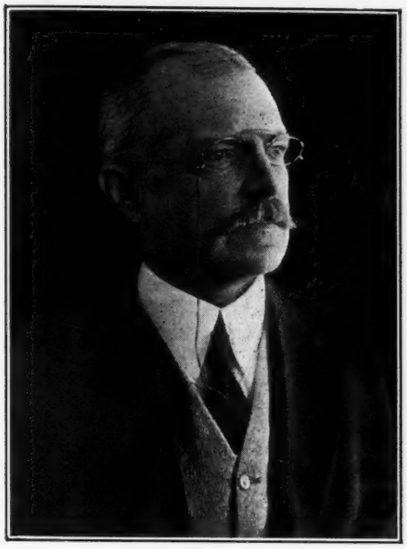
The local branch of the Canadian Institute of Mining and Metallurgy held a session at Rossland, B. C., on July 28, attendance being mostly from Rossland and Trail. Papers read included one by James Buchanan, superintendent of the Trail smelter, who dealt with the smelting of lead ores. R. W. Diamond, superintendent of concentration at the Trail smelter, contributed a paper on general ore concentration, and Frank E. Lee, head of the Consolidated M. & S. Co.'s research department, discussed in detail the elements of zinc cells.

C. I. M. M. Will Visit Cons. M. & S. Co.'s Sullivan Mine

Plans are developing for entertainment of the Canadian Institute of Mining and Metallurgy and Columbia Section, A. I. M. E., members of which will gather at Cranbrook, B. C., Aug. 21, for four days of combined business and pleasure. Details are in the hands of the East Kootenay division of the British Columbia Prospectors' Association and the Cranbrook Board of Trade. The main excursion, it is announced, will be to the Consolidated M. & S. Co.'s Sullivan mine at Kimberley, the trip to the mine to be made by auto.

MEN YOU SHOULD KNOW ABOUT

Waldemar Lindgren returned to New York on Aug. 11 from Bolivia, where he has been for several months.



WALDEMAR LINDGREN

W. S. W. Kew is on a trip in lower California.

J. E. Spurr is in New Hampshire for two weeks.

W. Waters Van Ness has returned to the United States from Mesopotamia.

H. D. Phelps has opened an office in the Bashford Building, Prescott, Ariz.

K. C. Heald is investigating reported seepages of gas near Grand Island, Neb.

J. B. Mertie, Jr., is studying the placers in the vicinity of Livengood, Alaska.

Eduardo Enriques has established an office at Paseo Bolivar 802, Chihuahua, Mexico.

G. C. Martin is making a study of mining conditions in the Koyukuk River region of Alaska.

Walter L. Maxson has been appointed assistant professor of metallurgy at the Colorado School of Mines.

Edmund N. Hobert, of the American Smelting & Refining Co.'s Mexican department, is in Los Angeles.

L. B. Weed, general superintendent of the Colorado Fuel & Iron Co., at Pueblo, Col., was in Duluth recently.

Prof. H. E. T. Haultain, of the University of Toronto, is spending part of his vacation in northern Ontario.

A. L. Flagg, of Phoenix, Ariz., was in New York last week. He expects to return to Phoenix about Sept. 1.

Theodore Pilger, mining engineer with the Allis-Chalmers Manufacturing Co., has been in Ohio recently on professional business.

C. E. Newton, of Corvallis, Ore., has arrived in New York after making an automobile trip across the continent in twenty-eight days.

George Roll, mining engineer, who has been in Arizona and New Mexico recently on professional business, has returned to New York.

Dr. Stanley Smith has been appointed assistant in the departments of mineralogy and geology at Queen's University, Kingston, Ont.

Edward B. Durham, engineer for the Standard Chemical Co., at Canonsburg, Pa., has taken a leave of absence and gone to Pachuca, Mexico.

H. S. Munroe, general manager of the Granby Consolidated Mining, Smelting & Power Co., is in New York and will soon return to Anyox, B. C.

Prof. H. L. Smyth, of Cambridge, Mass., consulting geologist of the Cleveland-Cliffs Iron Co., is spending the summer in Ishpeming, Mich.

Horace V. Winchell recently visited the plant of the Mesabi Iron Co., at Babbitt, Minn. Mr. Winchell is a director of the operating company.

W. Lee Heidenreich, who is in charge of the Nipissing Mining Co.'s oil-well operations in Kansas, is in Utah on other business for his principals.

A. E. Fath has been designated as acting geologist in charge of the oil and gas section of the U. S. Geological Survey during the absence of K. C. Heald.

Fred Carroll, vice-president and general manager of the Atlas Mining & Milling Co., and formerly Commissioner of Mines of Colorado, was in New York last week.

M. E. Cassidy, who has been in the employ of the Phelps Dodge Corporation at Bisbee, Ariz., for many years, has been appointed prohibition director for Arizona.

Dr. R. B. Moore, of the U. S. Bureau of Mines, is paying a visit of inspection to the western stations of the Bureau. He will be away from Washington a month.

F. W. Gray has resigned the editorship of the *Canadian Mining Journal,* having accepted a position on the staff of the British Empire Steel Corporation in Montreal.

A. W. Newberry, having completed examination work in Montana, will spend some time in Idaho and other Western states visiting the prominent mining districts.

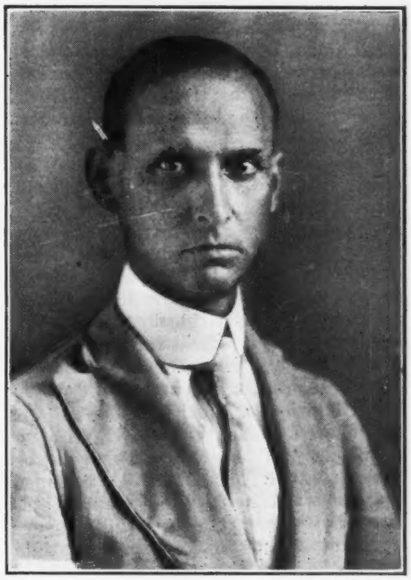
Harry Mills, Ontario Minister of Mines, has returned from a trip through Minnesota, where he has been making investigations as to the treatment of low-grade iron ores.

M. G. Gulley expects to discontinue his work in the Wyoming oil fields by Sept. 1. W. T. Lee and J. B. Reeside have already concluded their season's field work in that state.

S. R. Elliott, assistant general superintendent of the Cleveland-Cliffs Iron Co., at Ishpeming, Mich., visited the properties of the company and those of the Mesabi-Cliffs Iron Company, a subsidiary, on the Mesabi recently.

O. M. Schaus, superintendent of the Montreal mine for the Oglebay-Norton company, at Hurley, Wis., has been appointed assistant to **E. W. Hopkins,** manager for the company on the Gogebic Range; **R. A. Angst,** superintendent of the Woodbridge mine, at Buhl, Minn., has been appointed general superintendent, with headquarters at Montreal, Wis., with **John M. Price** as superintendent and **V. D. Johnson** as assistant superintendent.

Oliver Bowles, of the staff of the U. S. Bureau of Mines, has been assigned to study means of stimulating slate production and of eliminating waste in its quarrying. Mr. Bowles has been with the Bureau since 1914 as a quarry and mineral technologist. His legal residence is in Minneapolis, Minn. He is a native of Ontario and was educated in the public schools of that province. His higher education was obtained at Lindsay Collegiate Institute and at the University of Toronto. He was graduated from the latter institution in 1907. Following his graduation, he spent two field seasons investigating iron and gold properties for the Ontario Bureau of Mines. He then went to the University of Michigan, where he served for one year as an instructor in mineralogy. He then joined the faculty of the University of Minnesota, where for four years he served as instructor in geology and mineralogy. Just before joining the technical staff of the Bureau of Mines, he was engaged in a survey of clay and building stone for the Minnesota Geological Survey.



Harris & Ewing

OLIVER BOWLES

Mining engineers and metallurgists recently in New York City included: Arthur K. Seeman, Golden, Col.; **Fred B. Ely,** Fort Worth, Tex.; **O. H. Rheinhold,** Washington, D. C.; **Bruce G. Middlemiss,** Chuquicamata, Chile.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Walter Fitch, Jr., Co. Claims 427½ Ft. Sunk in Thirty-one Days

The *Engineering and Mining Journal* has received the following telegram, dated Aug. 15, from the Walter Fitch, Jr., Co., which set out on July 15 to break the world's record for shaft sinking in the Water Lily shaft at Eureka, Utah:

"At 8 a.m. today total depth Water Lily shaft 543 ft., making net total advance in thirty-one day period of 427.5 ft. Certified measurement mailed."

New Copper Queen "Congress" Elects Speaker

Grant H. Dowell Addresses the Newly Organized "House of Representatives"

The Copper Queen "Congress" has been organized at Bisbee, Ariz., under the employee representation plan adopted June 28 by the employees of the Phelps Dodge Corporation there. Sam Verran has been elected speaker of the "House" and Robert McCartney secretary. Both are members of the mine force.

In his address to the new "House of Representatives," Grant H. Dowell, general manager, made the plain statement that the organization has not been formed for the purpose of overriding the authority of the foremen and bosses. The constitution was for the purpose of assisting in the enforcement of the square deal for all, he said. "It is the duty of the company to see that the employee is paid a living wage. It is, likewise, as much the duty of the employee to earn that wage. And it is the duty of the foreman and bosses to see that he does earn it." He added that the success of the new representation plan will depend in large measure upon the actions of the representatives whom the men have elected.

Negotiations With Men Succeed at Port Pirie

Special Cable by Reuters to "Engineering and Mining Journal"

Adelaide, Aug. 17—The negotiations for a resumption of work at the smelter of the Broken Hill Associated Smelters Prop., Ltd., at Port Pirie, Australia, have succeeded. It has previously been reported that the men had agreed to accept lower wages. The plant has been closed for some time.

WEEKLY RÉSUMÉ

No developments of note are reported from Washington for the last week. The Rules Committee has declined to advance the war minerals relief measure on the calendar. Representative Rhodes has introduced a bill calling for an investigation into the non-metallic mineral industries with a view to stimulating production. An amendment to the Tariff bill has been introduced which places certain duties on barytes.

It is announced from Mexico City that the government has restored the duties on imports and exports which, as previously announced, had been removed as an aid to mining. A coal strike is again threatening in Coahuila. In Durango construction of the Tepehuanes-Guanaceví railroad has been started. In South Africa, a serious strike is said to be pending at the mines on the Rand over the question of wages.

Reduction in freight rates on smelter products between various western points in the United States and the Atlantic seaboard has been announced. The miners at Tonopah and Divide have declared the strike there lost and have returned to work. In Arizona the employees of the Phelps Dodge Corporation at Bisbee have organized their "Congress" under the newly adopted employee representation plan. The Salida smelter in Colorado has finally been taken over by the Shaw-Davis interests. It is reported that the Alaska-Treadwell interests have entered the Keno Hill district in Yukon Territory.

Freight Rates on Lead and Other Smelter Products Cut

On Aug. 5 the Pacific Coast North Atlantic Eastbound Conference reduced the freight rate on pig lead from all Pacific ports to all Atlantic ports from $8 per ton to $6 per ton. The minimum weight is 6,000 lb. The rate on copper bullion had been similarly reduced the previous week.

G. W. Luce, freight traffic manager of the Southern Pacific, announces that, effective Sept. 12, the rate on smelter products from Cananea and Arizona points to New England points will be reduced from $21.10 to $17.60 per ton, and to Baltimore the rate will be reduced from $20 to $16.50 per ton. These rates apply on shipments via New Orleans or Galveston in connection with the Southern Pacific Atlantic Steamship lines. The rates are intended to compete with those possible via Pacific Coast ports and the Panama Canal.

Mexico Restores Taxes on Imports and Exports as on June 15, 1919

Drops Paternalism Toward Mining Companies—Latter Must Paddle Their Own Canoe

Mexico City—The Federal government has announced that from now on the mining industry must work out its own salvation, free from special tax exemptions on imports and exports as well as special considerations in the way of ground taxes. Every tub on its own bottom. For the future the governmental attitude toward mining will be applied also to oil and agriculture. In brief, the present officials are fed up on paternalism and propose to try the merits of self-help.

A prominent official of the Department of Industry and Commerce in speaking of the situation says: "During the six months that the decree in question has been in force exempting mines from taxes, our products have had more than ample time to secure the readjustment of their exploitation and bring expenses and sales nearer together. That there has been a big drop in expenses favorable to the miner cannot be denied and the government feels that, as it has had part in the readjustment work, it is proper now that the mining companies recognize the necessities of the government by paying with good grace reasonable taxes. It must be recognized that the mining industry cannot consistently claim exclusive rights to be carried when it is known that all the other industries of the country are having their individual problems in the general reorganization of economic conditions."

The official then calls the attention of mine operators to the fact that the mining crisis which affected the country in 1907 was attributed to the monetary reform of 1905 and led mining men to predict a total paralysis of the industry. Contrary to these assertions the crisis was solved without obliging the government to grant any special exemptions in the way of relief from taxations and producers succeeded in working the matter out by economies which caused production of gold and silver, at least, to again become profitable within a short period.

The department believes that the exemption of taxes as a medium of relief for the industry is an economic error. It believes that so long as the miners are permitted to lean on the government they also permit the gov-

ernment to do the worrying; that is, they are disposed to allow the readjustment to work its own way rather than taking an active interest in forcing the situation.

The mining companies do not accept the official view of the situation and insist that unless the government continues its paternal assistance, at least for a time, disaster faces the most important industry of the republic.

The new decree went into effect Aug. 1 and mines are now paying export taxes and import taxes on supplies, consular fees, etc., as per the old decree of June 15, 1919. In view of the fact that metal prices have considerably improved during the past thirty days it is not probable that the tax will interfere with the actual operations in any of the important properties of the country. In fact some of the largest operators concur in the government's contention that the industry will be better in the end without artificial respiration.

Salida Smelter Taken Over By Shaw-Davis Interests

Colorado Operators Hopeful That New Plant May Compete With A. S. & R.

There is much speculation among Colorado mine operators regarding the recent acquisition of the Salida smelter by the Shaw-Davis interests, who are reported to be the principal owners of the Rawley mine, in Saguache County. The Salida smelter was built in 1901 by the Ohio & Colorado Smelting & Refining Co., a subsidiary of the American Metals Co., and was operated continuously until February, 1920. Soon after closing, the smelter was sold to Morse Brothers Machinery & Supply Co., which kept the plant intact subject to a contract for sale.

The Rawley mine is an extensively developed lead-silver-copper property, situated in the Kerber Creek district of Saguache County. It is developed by a 6,000-ft. crosscut tunnel with a 1,200-ft. upraise to the surface. Ten levels have been driven on the vein, with something over 500 ft. of drifts.

At present the American Smelting & Refining Co. operates the only smelters in the state, one at Leadville and the other at Durango. Since 1919 the company has closed down two of its plants in Colorado, the Denver plant in July, 1919, and the Pueblo plant following the flood in June of this year. Ores originating in the northern districts must be shipped to Leadville, involving an increased transportation charge of about $1.50 per ton.

Owing to limited production and high transportation and smelting rates, the situation is unsatisfactory to both the operator and the smelter, and the advent of an independent smelter, more centrally situated, will no doubt result in keen competition, and, it is believed, higher prices for the output of the mines.

Strike Off at Tonopah and Divide

Miners Vote To Return, in Spite of Efforts of Radicals—Tonopah Mining Co. Resumes Operations

The strike in the Tonopah and Divide districts in Nevada against a decrease in wages of 75c. per shift, affecting all classes of day labor, and which has delayed operations in practically all mines in the districts since April 16, has been lost by the mine workers. On Aug. 6 the hoist engineers' union announced officially that it considered the strike lost and that all members were free to apply for positions. On Aug. 7 other crafts' unions did the same, and the miners' organization, there being no regular miners' union in these districts, deputized a committee to meet with the operators on Aug. 8 to determine whether old employees would be accepted without discrimination in case they applied for work. On receiving assurance that no discrimination would be shown, they reported back to the miners in open meeting, and after a stormy session the strike was declared off.

The radical element, for personal reasons, attempted to keep the strike in effect, and succeeded in preventing all men from having a vote who are working, even those who have been on strike for almost four months and who went back to work Aug. 7 on assurance that the strike would be called off. The first ballot was a standing ballot and resulted in a vote of 89 to 80 to continue the strike. The conservatives then called for a secret ballot, with the result that the vote stood 95 to 63 to call the strike off. The small vote shows how a few radicals have been controlling the situation; there are about 1,000 miners in the district at present, and at least 400 of these are not working at present.

Crews are being assembled by all the mines which were affected by the strike, and there appears to be no doubt that conditions in both the Tonopah and Divide districts will be normal within a few weeks. The Tonopah Mining Co. resumed work Aug. 8 with about fifty men. The settlement of this strike will undoubtedly have a beneficial effect on the mining industry throughout all the mining districts in the state.

Recent bullion shipments, representing clean-up of operations for the two weeks ended July 31, were as follows: Tonopah Belmont, $70,000; Tonopah Extension, $40,000, and West End, $81,000. The clean-up at the West End mill was larger than usual, on account of the Halifax company shipping some very high-grade ore to the mill during July. Bullion shipments this month are expected to increase.

Colorado Operators Benefit

American Smelting & Refining Co. Lowers Treatment Charges for Lead and Copper Ores

As a result of the recent reduction in freight rates on lead and copper bullion from Western smelting points to seaboard refining plants, the American Smelting & Refining Co. announces a reduction in treatment charges for lead and copper ores of between 4c. and 5c. per unit of metal contained.

The movement to secure a readjustment of bullion rates initiated by the Colorado Metal Mining Association last October and later joined by the mining organizations of Western smelting states has brought results of wide-reaching effect. The reduced cost of moving bullion to seaboard refining points will be reflected back in reduced smelting charges throughout the West, and means an annual saving of several million dollars to the lead and copper producers.

The following table gives the pre-war rate, the Aug. 10 rate, and the new rate applicable to the principal western smelting points. A differential of $2 per ton in favor of rail and water shipments via Pacific Coast points or from Galveston is also announced:

		Prior to May, 1918	Prior to New Rate	Effective Aug. 10
San Francisco, Cal.	to New York	$13.50	$22.00	$16.50
Miami or Globe, Ariz.	to New York	12.50	22.00	16.50
Northport, Wash.	to New York	12.00	22.00	16.50
Helena or Butte, Mont.	to New York	10.15	22.00	16.50
Salt Lake, Utah	to New York	10.15	22.00	16.50
Denver or Pueblo, Col.	to New York	7.65	19.00	14.15
Leadville, Col.	to New York	11.65	22.00	16.50
Durango, Col.	to New York	10.65	22.00	16.50

Based upon the 1920 shipments of bullion, the saving to Colorado operators will approximate $200,000 annually, and to Utah operators upward of half a million dollars.

Tax Dispute at Chisholm, Minn., Still Unsettled

The dispute between the village council of Chisholm, Minn., and the three mining companies, namely, the Hanna Ore Co., the Oliver Iron Mining Co. and the Shenango Furnace Co., over the failure of the mining companies to pay their taxes, is still far from settled. The situation is about the same as it was months ago.

A proposal submitted by the merchants of the village and acceptable to the mining companies, that the tax be fixed at $60,000, with a stipulation that the village limit its expenditures to $30,000 per month and the remaining $240,000 go toward the payment of the village's indebtedness, was rejected by the village council. It is contended by the mining companies that the village can legally levy only a tax of $411,000, which is the limit of taxation on their properties. A counter proposal requesting a larger amount of total taxes and a larger expenditure per month was not acceptable to the mining companies, and to date no other action has been taken by either side. The companies have stated that they will permit the law to take its course.

Utah Power Company To Develop More Power on Bear River

Planned To Add 21,500 hp. to Present Generating Capacity

Unusual interest attaches to the plans of the Utah Power & Light Co., under preliminary permit issued by the Federal Power Commission on July 19, for extensive power developments on Bear River, in southeastern Idaho, as the projected works will impound water for irrigation as well as power, and will complete the utilization of the river for power purposes at all practicable points from Bear Lake, in the mountains of Idaho and Utah, to Great Salt Lake. This will make Bear River one of the most completely utilized streams for irrigation and power purposes in the West.

The completed project will add 21,500 hp. of hydro-electric energy to the generating capacity of the company's system, now capable of developing about 165,000 hp., and will be connected with the big main transmission system now operating at 130,000 volts, extending from Grace plant, in Idaho, to Salt Lake City, a distance of 134 miles, and supplying a population of 300,000 with power, much of which is used in mining and manufacturing. This additional development will give added reliability in power supply, and will serve to steady some of the company's smaller plants located on other streams having variable flow. The company has 33 months to study the amount of water available at each site.

Engineers' Registration Board Organized in Minnesota

Paul Doty Appointed Chairman—Many Expected To Register Promptly

The organization of the Minnesota state board for registration of professional engineers, architects, and land surveyors is practically complete. At the initial meeting all members were present, and the following officers were appointed: Paul Doty, of St. Paul, chairman; N. Y. Tylor, of Litchfield, vice-chairman; and H. T. Downs, of Minneapolis, secretary-treasurer. The other members present were: A. F. Gauger, St. Paul; F. M. McKellip, Faribault; F. G. German and Dwight E. Woodbridge, Duluth. Committees have been appointed, and soon after a procedure for registration is decided upon the board will be able to receive applications for registration. It is expected that many engineers, architects, and land surveyors will avail themselves of the registration privilege. It is possible, under a provision of the law, that applicants who have been in actual service for a stipulated time, and who can conform to the standard set by the board, can register without an examination.

British Iron Mines Reopened

Special Cable by Reuters to "Engineering and Mining Journal"

London, Aug. 9—The Cleveland iron mines, which have been idle since March, were reopened this week, the miners having accepted a further reduction in wages.

Mt. Morgan's Proposal To Resume Work Fails

Unions Reject Offer To Pay Men on Sliding Scale Based on Price of Copper

Brisbane, July 4—A conference that has just taken place between the Mount Morgan directors and the union representatives, which it was hoped would have ended the present stoppage of work, has unfortunately proved abortive. The company's proposal was for the men to be paid on a sliding scale based on the ruling price of blister.

Furnaces in Blast

At the beginning of August the following furnaces were in blast at the plants named (the list is by no means complete):

Plant	No. of Copper Furnaces	Cop. Furnaces in Blast	No. of Lead Furnaces	Lead Furnaces in Blast
Trail	3	1	4	2
Granby (B. C.)	4	4	..	..
Calumet & Hecla	24	2	..	..
Quincy	6	1	..	..
Michigan	5	2	..	..
Peñoles Co., Torreon	1	1	8	3
Peñoles Co., Mapimí	..	..	6	..
A. S. & R., Asarco	3	..	3	..
A. S. & R., Chihuahua	..	..	8	8
A. S. & R., Aguascalientes	8	2	2	1
A. S. & R., Monterrey	..	..	8	..
A. S. & R., Matehuala	4	4	..	..
Midvale, Utah	..	..	..	4*
International, Utah	..	..	..	0
Murray, Utah	..	..	..	4
Tacoma, Wash	4	1	..	..
Northport, Wash	..	..	3	..

* Also one on matte concentration. No furnaces were in blast in Arizona.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Assessment Work Bill Awaits President's Signature

The Senate has passed without amendment the bill changing the assessment work year from a calendar to a fiscal year basis. The bill has already passed the House and now goes to the President for signature, which is assured.

Hearings on Mining Law Bill Expected in December

Ample Opportunity in Meantime for Thorough Discussion of Its Merits —Many Copies Distributed

Hearings on the bill providing for fundamental changes in the mining law are expected to begin in December. Representative Arentz, who introduced the bill, states that he will request that the hearings begin about the middle of December. This will give ample time, he believes, for all concerned to study the bill and make any suggestion desired as to its amendment. He has made arrangements with Director Bain of the U. S. Bureau of Mines to classify these suggestions as to amendments which should be made in the bill as drafted. All letters received in connection with this legislation will be studied by the legal division of the Bureau of Mines and a digest made of all suggestions.

Mr. Arentz points out that the matter of revising the mining law has been agitated for a number of years and that the purport of this legislation now should be well understood. Since July 12 the draft of the law as recommended by a committee headed by W. R. Ingalls has been available for distribution to anyone interested. By the middle of December a reasonable length of time will have been allowed for study of this draft. At that time a further opportunity will be given for an oral presentation of any objections which may be advanced. An opportunity also will be afforded for proponents of the legislation to point out the urgent needs for its prompt enactment. Mr. Arentz believes that the matter will have been pending long enough at that time to have given everyone concerned a fair chance to present his views. He expects to press the legislation and anticipates that the Committee on Mines and Mining will recommend his bill for passage after such amendments as may be found necessary to meet the objections which may be raised.

The revision of laws bill was introduced by Mr. Arentz in exactly the form that it was submitted by the Ingalls committee. Mr. Arentz himself expects to have some amendments to offer when the bill comes up before the committee.

About 2,500 copies of the bill already have been distributed, and requests for the document are being received in increasing numbers each day. Arrangements have been made so that all legitimate requests for a copy of the bill can be filled. Copies may be secured by applying to Representative S. S. Arentz, Washington, D. C.

No Preference for War Minerals Relief Bill

Measure Must Await Turn in Regular Order, Says Chairman of the Rules Committee

Refusal by the Committee on Rules to grant any preference to the bill liberalizing the War Minerals Relief Act disposes of any possibility of securing early action on that measure. The bill will not be reached in the regular order before the Congressional recess. Representative Rhodes, the chairman of the Committee on Mines and Mining, did all in his power to induce the Rules Committee to provide for priority in the consideration of the war minerals relief amendment. The chairman of the Rules Committee pointed out that many matters of greater importance to the people as a whole are before the House and could not be deferred for the consideration of the war minerals bill.

Tariff Amendment Changes Duty on Barytes

An amendment to the tariff bill providing that barytes ore is to be dutiable at ¼c. per lb. has been introduced by Senator Spencer, of Missouri. In addition, the amendment provides that the ground product is to be dutiable at ¾c. per lb., and the precipitated barium sulphate is to be dutiable at 1c. per lb.

Production of Non-Metallic Minerals Needs Stimulating, Says Rhodes

Introduces Bill Authorizing Investigation of These Industries—Should Heed Lesson War Taught

With Congress prescribing particularly high rates of duty to foster the chemical industry, Representative Rhodes, the chairman of the House Committee on Mines and Mining, believes the Government should undertake a comprehensive program looking to the stimulation of the production of non-metallic minerals from which the chemical industry draws much of its raw material. It is Mr. Rhodes' intention to concentrate his efforts toward securing such action. He is assured of the unanimous support of the Committee on Mines and Mining.

As the first step of this program, Mr. Rhodes has introduced the following bill:

"That the United States Bureau of Mines be authorized and directed to carry on investigations as follows:

"1. To conduct inquiries and scientific and technical investigation in the United states and its territories concerning the mining, treatment, and utilization of non-metallic minerals, such as sulphur, phosphate rock, feldspar, potash, mica, graphite, talc, barytes, limestone, and so forth with the main object of elimination of waste both in their production and utilization.

"2. To conduct investigations for the purpose of aiding in the efficient production of the non-metallic and other mineral raw materials for the chemical industry, and to investigate and obtain fundamental data needed for the efficient production of chemical products from mineral sources."

Mr. Rhodes points out that no other industry was developed during the war to the same extent as was the chemical industry. A natural complement of tariff protection for the industry is the stimulation of the production of such domestic raw materials as that industry can utilize, Mr. Rhodes believes. He contends that the development of the non-metals has lagged far behind that of the metalliferous minerals. As evidence of that contention, Mr. Rhodes points to the action of Congress during the war in authorizing an appropriation of $50,000,000 in an effort to stimulte the prompt production of a number of minerals then urgently needed for war purposes. Among them were about forty non-metals. "Now that the war is over," said Mr. Rhodes, "we are content to settle back comfortably and allow ourselves to follow the line of least resistance and continue to buy our non-metals from foreigners. When the country needed these minerals most we found that they were undeveloped. We have had our lesson. Now there is no excuse for our failure to achieve economic independence in practically all of the non-metals."

NEWS BY MINING DISTRICTS

London Letter

Strike Possible at Mines on Rand; White Workmen Resisting Proposed Wage Reduction—Globe & Phoenix Ore Reserves Declining

BY W. A. DOMAN

London, Aug. 2, 1921—At the time of writing it would appear that a strike is threatened in connection with the mines of the Rand. The position has become serious for the Chamber of Mines insists upon a reduction of the wages of white workers, and the latter are resisting. Cablegrams on the subject from Johannesburg are of a somewhat misty and conflicting character. Last year when gold was selling at a high price and the cost of living was rising the men demanded, and obtained, advances in wages amounting to 48/- per week. As at least half the number of mines are only kept going by the gold premium the chamber is alive to the necessity for reducing working costs, and it is apparently mainly in wages that this can be accomplished. The suggestion put forward was moderate, 3/- per shift, to be accompanied, however, by a fair day's work, for it is recognized that the men do not give this. Simultaneously with the proposal the price of gold rose again, and the matter appeared to the men to be unwarranted. The reduction was consequently made 1s. 6d. per shift. To this, however, the miners will not agree, and after numerous meetings the executives of the various unions concerned have recommended a strike. The attitude they adopt is that half the 48/- weekly, and any advances based upon it, should be consolidated as wages, the balance to vary according to the cost of living. An immediate strike is not contemplated, as the leaders have approached the chamber to find a way out of the difficulty. So far as can be gathered the chamber is rather invertebrate, and from this side is being urged to stronger action. In London, where the bulk of the money is found, it is desired that the whole 8/- per shift conceded last year should come off.

Matters are made rather more difficult in this way. Directors of some mining companies contend that operations cannot continue, while the management of others is looking to the future and arguing upon profits that will be made owing to the probable continuance of the gold premium for several years. In the latter respect they are doubtless correct, but at least half the companies will never re-enter the dividend list, even with the premium. Investors in Kaffirs have become heartily sick of hearing of the high price at which the product can be sold, and of getting no return upon their outlay. The result is that the share market is quite lifeless. Only the high-grade mines report a divisible surplus, and with two or three exceptions they are unable to reduce their level of costs. Sir Lionel Phillips has left for the Cape, and it is hoped that he may be able to find a solution to the problem.

A steady but serious decline is taking place in the ore reserves of the Globe & Phoenix mining company. This may be shown as follows:

	Tons	Value at standard price
Dec., 1918	159,913	£988,293
Dec., 1919	108,182	745,000
June, 1920	101,116	677,191
June, 1921	89,491	571,309

As the mine has produced the whole time it is evident that a certain quan-

tity of new ore has been added, but a distinct drain is noticeable. The position, too, is affected by the fact that at the end of 1920 rather more than 50 per cent of the reserves was in the form of pillars, and consequently is not immediately available for treatment. A few months ago some very high-grade ore was being opened up. The reef, however, was narrow, and as little has lately been heard of this development it may perhaps be inferred that its importance is not great. The directors have not led shareholders to expect great things, as much depended upon whether this new reef junctioned with the old, and so made a good solid orebody. As things go, the value of the reserves is high—30.39 dwt. per ton—but on the present occasion no mention is made of the tonnage of ore in pillars, nor its gold content.

CANADA

British Columbia

California Mine at Nelson Resumes Operations

Nelson — Announcement has been made of resumption of active operations at the California mine and Athabasca mill, the latter being under lease to the California operators. Considerable money has been spent during the last two seasons in modernizing the mill.

Sandon—The Silversmith Mines, Ltd., continues to employ about thirty-five men in making the changes involved in amalgamating the Silversmith and Ivanhoe milling equipment, and in the construction of the new tramway from the Silversmith mine to the Ivanhoe mill site.

Greenwood — Local residents have begun active development of the Riverside property near Rock Creek.

Trail—Shipments received at the Consolidated smelter the week ended Aug. 7 totaled 7,837 tons and were as follows:

Mine	Locality	Tons	
Freddy Lee,	Sandon	24	
Knob Hill,	Republic	85	
Kokomo,	Beaverdell	8	
North Star,	Kimberley	46	
Majestic,	Sandon	5	
No. 1 Mine,	Ainsworth	33	
Surprise,	Republic	322	
Skyline,	Ainsworth	20	
Whitewater,	Retallack	39	
Bingo		826	(lb.)
Company Mines		7,255	

Nelson—Free milling gold is reported as having been found on the Gold Tread claim of Terzian Bros., at Mankin Siding, on the Nelson & Fort Shepherd branch of the Great Northern Ry. Sampling gave an average of $10.40 per ton in gold. The owners have refused to consider a bond for a substantial sum, it is reported.

Invermere—The Toby Creek Mining Co., Ltd., owning claims on the creek of the same name, is making a test shipment and upon the results will determine whether or not to proceed with mill construction.

Ontario

Results at Silver Islet Disappointing—Temiskaming May Be Reopened

Silver Islet—The syndicate which recently unwatered the old Silver Islet mine on the north shore of Lake Superior has found that the old Cornish miners who worked this property did not leave much behind. It was thought that all of the roof of the stope under the lake was in high-grade ore, but when the mine was pumped out high-grade ore was found in only one place. While there is little question but that the old roof does contain ore it has been decided that it would be too expensive to mine. The company will however drive a 1,200-ft. crosscut in the hope of picking up other veins. This property was opened in the earlier 60's of the last century and produced about 3,500,000 ounces of silver.

Porcupine—In the last three months profits from the Dome Mines, Porcupine, have been in the neighborhood of $250,000. The company can easily pay 20 per cent dividend and in addition can make a capital reduction if it seems desirable. The president has stated that the latter is probable and it is known that some of the directors are favorable to it.

Porcupine still continues to be the high wage camp of northern Ontario, and operators in other camps are beginning to wonder if the intention is to maintain them and draw the best miners to the Porcupine mines. The Porcupine scale is now about 75c. a shift higher than other camps. When the silver and nickel camps reduced wages, the gold camps did not follow suit, because with six years of unfavorable operating conditions behind them they did not want to do anything to stop the supply of men from coming to the camp. It is now felt, however, that with a plentiful supply of labor and operating conditions in favor of the companies, something should be done. It has, however, always been difficult, due chiefly, it may be said, to the Hollinger, for the operators in Porcupine to get concerted action, and this case will probably be no exception.

Cobalt—W. J. Post, who has a lease on the Silver Queen, has started to ship ore to the Bailey concentrator.

The Castle property in Gowganda, which lost its power plant by fire some time ago, has closed. The company has some good ore, but needs to be refinanced before operations can be started again.

There is some talk of reopening the Temiskaming. The company has a considerable supply of broken ore in the stopes in addition to a large tonnage of old tailings. A plant was constructed to treat these a short time before the property closed.

The Nipissing company during June mined ore of an estimated value of $166,363, of which $140,983 was silver and $25,380 cobalt, and shipped bullion from Nipissing and custom ores of an estimated net value of $223,057. The low-grade mill treated 7,258 tons and the high-grade plant 185 tons.

Toronto—It is stated that the Northern Light Railway Co. has completed the sale of its bonds issued to finance the construction of a narrow-gage railway to the outlying mining camps east and west of Swastika. Engineers will be at work in a few days, and actual construction will begin soon, with the object of completing the line east to Larder Lake and west to Fort Matachewan before winter sets in. The sale is understood to have been made to a bond house, and it is thought that the financial arrangement provides for a weekly payment from the purchaser to the railway company.

MEXICO

Federal District

Mexico's Mineral Output in Year Ended June 30, 1921

The mineral output of Mexico for the twelve months ended June 30, 1921, is given by the Department of Commerce and Labor as follows: Gold, 10,420 kg.; silver, 922,312; copper, 46,056,900; lead, 121,434,066; zinc, 14,363,057; mercury, 77,229; antimony, 1,572,376; graphite, 2,911,529; tungsten, 34,917; tin, 1,588; arsenic, 1,198,806, and manganese, 838,-624.

The same authority announces that there are 70,000 mines in the country, many of which are not being actually worked for one reason or another. It is also stated that about 3,000 properties are to be declared vacated for failure to pay taxes.

In the above connection statistics regarding the production of gold and silver since and including the year 1917 will prove of interest:

1917, gold 23,542 kg.; silver 1,306,988 kg.
1918, gold 25,313 kg.; silver 1,944,542 kg.
1919, gold 23,586 kg.; silver 2,049,898 kg.
1920, gold 22,864 kg.; silver 2,058,938 kg.

The decrease of the output for the last fiscal year may be attributed to a variety of causes, to the heavy drop in price of metals, unsettled political conditions and very largely to radical legislation which has been officially encouraged in many sections, and has naturally discouraged capital from going full swing.

Hidalgo

U. S. Smelting & Refining Co. To Build Bleichert Tramway at Pachuca

Pachuca—Edward B. Durham, engineer for the Standard Chemical Co. at Canonsburg, Pa., has taken a leave of absence from his own firm and gone to Pachuca, Mexico, for the U. S. Smelting, Refining & Mining Co., to supervise the designing of a wire-rope tramway of the Bleichert type, 5.8 miles long and to carry 75 tons of ore per hour. The tramway crosses a high ridge, so that with the large tonnage carried it will develop heavy stresses and will require 340 hp. in motors on its various sections. Most of the machinery will be furnished by the American Steel & Wire Co. The field engineer for the work is O. M. Sackett, of Colorado.

Coahuila and Durango

Coal Strike Again Threatening—Work Begun on Tepehuanes-Guanaceví Railroad

Saltillo—A general strike is again threatened in the coal fields of this state as a protest against the companies' efforts to reduce their working forces. As a consequence fuel shortage will no doubt soon be felt. It is said that steps are already being taken by the larger industrial enterprises to procure their coal from the United States.

In the meantime, the state officials are making an effort to arrange a satisfactory settlement between the owners and miners.

Torreon—Albert Genty will shortly begin shipping silver-lead ore from his Calaverita mines in the San Juan de Guadalupe district to the American Smelting & Refining Co.'s plant at Aguascalientes. Mr. Genty is constructing a broad-gage spur from the main line of the National Railways at Rivas station to the Sierra Ramirez, where his mines are located. This road is to be about 12 km. in length and all but about 1½ km. is finished. As soon as it is completed, large, regular shipments of ore will be made from the Calaverita as well as other mines in that vicinity.

Work is being started on the construction of the Tepehuanes and Guanaceví railroad which will give the Guanaceví camp facilities for ore and supply shipments. Smith Bros. have the concession for building this line and according to statements of reliable mining men, the material and necessary machinery are being placed on the ground.

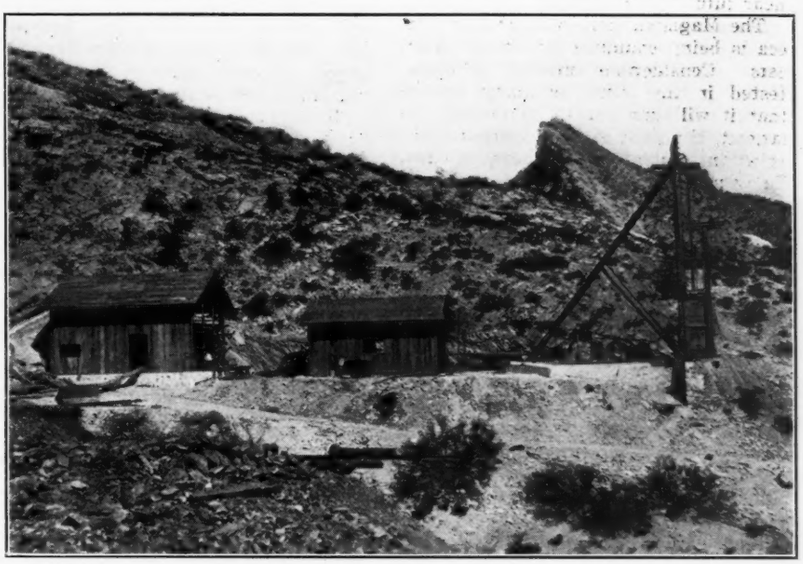
Chihuahua

Las Plomosas Properties Taken Over by Rio Conchas Company

Chihuahua—Cia. Minera Rio Conchos, S. A., a Belgian concern, has taken over the properties of the Cia. Minera Las Plomosas y Anexas, S. A., named Las Plomosas, and situated in the eastern part of the State of Chihuahua. The geological formation is of a purely sedimentary character belonging to the Jurassic and Triassic period. Marble overlays black slate, and the ore is found in blanket veins situated between the two above named formations. These veins are carrying zinc, lead and silver values, being mined mostly for zinc. The ore is a high grade calamine running 40-50 per cent zinc. The mines have already produced 64,000 tons of zinc ore and 8,000 tons of lead oxides. Extensive development work amounting to about 5,000 ft. was done in previous days. At present a new vertical shaft is being sunk to the depth of 120 meters and crosscuts will be run into the blanket vein, which has a dip of 35 deg. A new headframe, 42 ft. high, has been built and a 25-hp. Fairbanks-Morse hoist, a new 75-hp. Oats boiler, a 55-hp. Fairbanks-Morse air compressor and one No. 7 Cameron vertical pump were installed. Sullivan P. D. 53 air drills will be used at the mine.

The mine is equipped with a large office and staff house, a warehouse, and many workmen's houses accommodating about 200 families. A new water conduit about one-mile long is supplying the mine with abundant boiler and drinking water.

The wagon road to Picachos, a railway station of the Kansas City, Mexico & Orient Ry., has been rebuilt in its total length of seven miles, and large trucks will be used for hauling the ore. At present over ninety men are being employed and a far greater number will be used as soon as the main shaft is completed. Raoul Glockner is the general manager of the Chihuahua division of the company.



SHAFT ON PROPERTY OF CIA. MINERA RIO CONCHAS, CHIHUAHUA, MEXICO

(Via El Paso)—The stockholders of the Erupcion Mining Co. have authorized an increase in the capital stock from $1,000,000 to $1,500,000, at par, $1, to build a railroad from the Mexican Central line to the Erupcion property in Los Lamentos district, Chihuahua.

Jalisco and Nayarit

Many Projects Entered Upon a Year Ago Now Suspended—Cinco Minas and Amparo Mills Running at Capacity—Mining at Standstill in Nayarit

Via Guanajuato—The low price of all metals has very seriously affected mining operations in the states of Jalisco and Nayarit. A year ago there was a great deal of activity and a mining boom was confidently expected. The large mining companies of El Oro and Pachuca, in their search for fresh fields in which to invest their surplus capital, turned their attention to the West Coast, and many options were secured by them, and much reconnaissance and prospecting work was done. Today, a good deal of this work has either been suspended or curtailed, pending more favorable conditions, such as either a rise in the metal markets or a fall in the cost of the materials used in mining. Local conditions are favorable, as there are no political troubles and all banditry has disappeared.

The Esperanza Company, of El Oro, took a bond and lease on a large group of old mines in the mining district of Cuale, not far from the port of Las Peñas. The Cuale district was extensively worked by the Spaniards, and since their time Mexican miners have operated sporadically, producing silver by the use of the old patio process, the working of which can still be seen at an *hacienda* in the district. The Esperanza Company undertook a vigorous prospecting campaign in which diamond drills were largely used. Results are said to be favorable, and it is believed that large tonnages of ore can be made available. A mill and cyanide plant of large capacity is projected. A road to the port of Las Peñas will be built, and a steamer will be purchased by the company to bring in its supplies from the Pacific ports of the United States. Freight communication with the present railroad system of the country is impossible, as the nearest station is Ameca, distant four days' ride over trails passable only to animals. At present, all this projected work is being held up for the reasons expressed in the opening paragraph of these notes. There is no doubt, however, that as soon as conditions warrant, work on a large scale will be started. The veins in the district carry values mainly in silver. Gold is present, but in small quantities.

The El Oro Mining & Railway Co. has an option on the famous old Casados mine in the Hostotipaquillo district of Jalisco, and is at present unwatering the mine for examination.

The Mazata mine, also in the Hostotipaquillo district, is being examined by a company having large interests in the neighborhood. For some time past, shipments in fair quantities of high-grade ore have been made from this mine, which is an old producer. In the

same district work on a number of smaller prospects is being carried on at present.

The San Rafael y Anexas Co., of Pachuca, is proceeding, although latterly on a reduced scale, with the equipment of the old San Pedro Analco mines on the Santiago River. The company has owned these mines for some time, and it is understood that the properties are very valuable. Enough ore is in sight to warrant the construction of a mill, work on which was started not long ago. The company will generate its own power, utilizing the water of the Santiago River for the purpose. Work on the power scheme is well advanced and completion in the near future is anticipated.

The Magistral copper mine near Ameca is being examined by strong interests. Considerable interest is manifested in this mine, as many believe that it will turn out to be one of the largest, if not the largest, copper properties in central or southern Mexico. The vein is very wide, running in places up to 400 ft. in width and carrying orebodies up to 80 ft. wide. The ore is said to be of good grade with sufficient values in gold and silver to pay the expenses of treatment and realization of the product. It is of a clean siliceous nature, and has been proved by large scale tests to be unusually amenable to treatment by flotation, very good recoveries being reported. There is a small plant on the property where the metallurgical tests that were made were carried out.

The Piedra Bola mine, near Ahualulco, is shipping a fair amount of high-grade ore to the American Metals Co.'s smelter in Monterrey. This mine belongs to Mexican interests.

The El Favor Mining Co., operating in the Hostotipaquillo district, was obliged to shut down its mill a few months ago owing to the low price of silver and the high cost of supplies. The company has large reserves of good ore in sight, but the presence of a high percentage of manganese makes the ore expensive and hard to treat, and the recovery has always been very low. All conditions must be very favorable to enable this company to operate at a profit.

Only two mills in Jalisco are at present running, that of the Cinco Minas Co., in the Hostotipaquillo district, and that of the Amparo Mining Co., near Etzatlan. Both are running at full capacity in spite of the general difficulties confronting mining today. In spite, also, of being located in isolated districts, both companies have been unusually successful in maintaining a practically uninterrupted continuance of operations throughout the various revolutionary troubles of the past ten years, furnishing a fine example of what can be done by determination and skillful management.

In the State of Nayarit, mining is practically at a standstill. The Espada Mines Co., operating in the Ixtlan del Rio district, closed down its mill a few months ago. There is a little prospecting and development work going on in the same district. In the rest of the state there appears to be complete inactivity.

Oaxaca

General Electric Co. Seeking To Purchase Local Power Company

Oaxaca—Mining denouncements here are steadily increasing, and several representatives of American companies are on the grounds making examinations and reports.

The General Electric Co. is treating for the purchase of the Oaxaca Light & Power Co. and planning large extensions. This would include the stringing of power lines throughout the Oaxaca Valley and the erection of a large customs mill at camp Taviche. The company has taken options on some of the largest properties there in order to guarantee sufficient tonnage.

The Cornejo Blanco mine, Taviche district, has recently developed a body of high-grade ore. The Escuadra mine is also now producing ore.

The local government has begun the construction of a cart road to connect with the Tehuantepec coast section of the state. This will open up an extensive mining region.

ARIZONA

May Open Benson Smelter — Night Hawk at Bisbee Developing New Sulphide Ore

Patagonia—The Blue Nose is resuming operations after a shut-down of more than a year. New hoisting equipment is being installed. Richard Kingdon is in charge.

The Andes tunnel has cut 12 ft. of copper ore reported to run better than 3 per cent. The tunnel has passed through this ore into material of lower grade.

Superintendent Wrenn of the Three R has gone to Searchlight to take charge of a property there.

Diamond drilling at the Hardshell has been started. Hall and Farley, who are leasing on the company's property, have made several shipments of a lead-silver ore of good grade.

Bisbee—Concreting of the Campbell shaft has been completed.

The Boras Leasing Co. has completed enlarging its shaft for a distance of 300 ft.

The Night Hawk Leasing Co. is developing a new find of low-grade sulphide ore. At present the body is 35 ft. by 25 ft. and contains a considerable amount of bunchy high-grade ore.

Tombstone—G. M. Butler is in Tombstone to determine conditions with reference to the tonnage that will be available for the Benson smelter if this plant is reopened. He represents eastern capital who will finance this proposition providing the desired tonnage can be guaranteed.

An accident to the engine at the Solstice mine has caused it to close down until parts can be shipped from El Paso.

Johnson—All the machinery, buildings and surface equipment of the Thouderbolt Copper Mining Co. is being sold to pay the debts of the company.

Clifton—In anticipation of possible purchase, the property of the Arizona Copper Co. is being checked by John McNair, comptroller, and W. K. Flora, assistant secretary of the New York office of the Phelps Dodge Corporation, assisted by H. M. Gallegher, auditor of the Douglas office; W. A. Meyer, manager of the Bisbee store, and O. M. Palmquist, purchasing agent for the Old Dominion Co. at Globe.

Douglas—The Arizona Corporation Commission has authorized the sale of 100,000 shares of the stock of the Dolores Copper Co., of Douglas, at $1. The company holds, under a Mexican corporation, a large tract of copper-bearing ground, three miles from Nacozari, Sonora, this being developed with a 500-ft. tunnel and several shallow shafts.

NEW MEXICO

Baltic Mine in Chloride Flat Leased to Silver City Men

Lordsburg — The Co-operative mine shipped a carload of silver ore to the El Paso smelter Aug. 10. It reports two cars of high-grade ore at the mine ready to ship as soon as roads are passable.

Silver City—The old Baltic mine, in Chloride Flat, belonging to the C. Amory Stevens estate, will be opened under a lease by Ira L. Wright, I. J. Stauber, James Bell, and E. W. Armstrong, of Silver City. The first shipment of ore from this property since 1893 will be made at once to the El Paso smelter.

A lease has also been secured in the Flat by Blackwell & Co., who have a small force working.

COLORADO

Vindicator Extending Roosevelt Tunnel From Portland Mine

Victor—The Vindicator Consolidated Gold Mining Co. has begun the work of extending the Roosevelt deep drainage tunnel from the Portland mine to the Vindicator mine, a distance of about 3,000 ft. The connection is to be made 5 x 7 ft. and will require about a year. Two headings are now being driven, one from the Vindicator mine and the other from the Portland. The total cost is estimated at $60,000. The tunnel will greatly reduce the heavy expense for pumping at the Vindicator.

Cripple Creek—The Cheyenne Leasing & Development Co. has secured a lease on part of the property of the Isabella Gold Mining Co., for five years, and will install new hoisting equipment at the Lee shaft, and begin a campaign of active development.

A new 700-ft. shaft will be sunk on the Elkhorn property on Tenderfoot Hill. Electrical equipment will be installed, including hoist and compressor,

suitable for sinking to a depth of 1,000 ft. The property is owned by the Denman Brothers, of Colorado Springs, and is under the management of Thomas Shaw.

Cripple Creek.—The new orebody recently opened in the Cresson mine is regarded as particularly important because it is located on the west run of the ore zone, with almost virgin ground to the surface, whereas most of the ore mined heretofore has come from the eastern part of the mine workings. The strike was made on the 16th and 17th levels. The ore shoot has been opened for a length of 130 ft. and is about 25 ft. wide. Much of the material can be shipped without sorting, and will assay over one ounce gold per ton. Stoping is in progress on both levels, and further development is under way.

Ophir.—The Summit property is being developed and operated by R. H. Wilson, lessee. A shoot of $20 ore has been opened and shipments are being made to the Suffolk mill, where ten stamps and ore flotation unit are employed in treating the ore.

Ophir Loop.—A 3-ft. vein of payable ore has been opened in the upper level of the Butterfly mine, by the Matterhorn Mining Co., under the management of P. J. Dills. Shipments are being made to the Butterfly mill, where ten stamps are in operation.

Telluride.—An automatic mucking machine, patented by H. B. Dennis, of Denver, has been installed at the Smuggler-Union and preliminary trials have been satisfactory.

UTAH

Bingham Galena on Trail of California Corporations Commission

Bingham Canyon — The Bingham-Galena Mining Co., which has been in the limelight for the last month or so, through the Utah Securities Commission is seeking an investigation by the United States Attorney General of an alleged violation of the Sherman anti-trust law on the part of the California Corporations Commission and other phases of the case growing out of the issuance in California of a warrant for the arrest of J. S. Herzig, known as George Graham Rice, and the Salt Lake brokerage firm of Child, Barclay & Co., associated with Herzig or Rice in the promotion of the Bingham-Galena. The Bingham-Galena stock was offered in a circular letter a few weeks ago to stockholders in the Broken Hills Corporation of California by Child, Barclay & Co., which quoted George Graham Rice as favoring the purchase of such stock so that losses incurred through the Broken Hills might be recouped. The stock of the Broken Hills corporation was raised from almost nothing to 50c. a share by the operations of Rice, and later fell to 4c. It will be remembered that the issuance of a license to the Bingham-Galena by the state securities commission was protested by the Utah Chapter of the American Mining Congress and by a well-known Salt Lake brokerage firm.

Alta—The Emma mine is being worked on company account and by lessees, one of the latter having recently made a shipment of silver-lead ore of good grade.

Ophir—The Ophir Hills is allowing the concentrates from its mill to accumulate.

Eureka—Shipments for the week ended Aug. 5 amounted to 152 cars as compared with 153 the week preceding. Shippers were: Tintic Standard, 38 cars; Chief Consolidated, 35; Iron King, 14; Eagle & Blue Bell, 13; Victoria, 12; Iron Blossom, 8; Dragon, 6; Swansea, 4; Sunbeam, 4; Mammoth, 3; Alaska, 3; Colorado, 3; Eureka Hill, 2; Eureka Mines, 1; Bullion Beck, 1, and Primrose, 1.

Park City—Shipments for the week ended Aug. 5 amounted to 1,563 tons as compared with 1,397 the week preceding. Shippers were: Silver King Coalition, 606 tons; Judge allied, 566; Ontario, 399.

The Spiro tunnel, which is being driven to prospect the Thaynes canyon section of the Silver King Consolidated, and to connect with the California-Comstock workings, is advancing at the rate of 4½ ft. daily. Exceptionally rich ore is reported in a raise from a drift extending to the southwest and starting about 13,400 ft. from the portal of the tunnel.

Salt Lake City—A tariff on lead is greatly desired by Utah operators; and Utah representatives in the Senate and House of Representatives are making every effort to obtain protection for the industry. As is well known, it is the silver with the ores in the lead mines of the state which keeps them going.

IDAHO

Coeur d'Alene District

Callahan Reaches Vein on 11th Level, Finding Better Ore Than on 9th and 10th

Wallace—John Borg, president of the Callahan Zinc-Lead Co., who is making the annual inspection of the company's properties, reports that the crosscut on the 11th level has just opened up 19 ft. of high-grade milling ore averaging 12 per cent zinc. This is the most important strike in four years and proves the big vein at depth, with higher values across a much greater width than the two levels directly above.

Other Districts

Elk City—Interest in gold mining is reviving in this district. A number of outsiders have been in lately, inspecting ground. Completion of a deal was made the first week in August when James Penman received a balance of $25,000 for the Homestake, Pennsylvania and Sadie H. quartz claims Nos. 1 and 2, in the Orogrande section, purchasers being the Homestake Gold Mining Co., which took an option on the property several years ago. The Orogrande Mining & Milling Co. has about completed the addition to its mill. The South Fork property, credited with a production of $250,000 in gold bullion, has arranged for deeper development.

Warren—The Idaho Mines Syndicate Co. has purchasd the ten claims owned by the L. T. Holte Mining Co., and which lie midway between Burgdorf and Warren. In 1917-18, the ground produced $350,000 in gold, it is stated. Underground work has not been done at any great depth, and the purchasing company proposes running a crosscut tunnel 1,600 ft., attaining approximately 400 ft. vertical depth. This work is to be undertaken this winter. The consideration involved is $250,000.

Boise—The Montrey Metals Co. has awarded a contract for driving a 3,000-ft. tunnel on the property of the company in the Boise Basin. The tunnel is projected to tap the bottom of the 565-ft. shaft in the Washington mine, which is being operated in conjunction with the Subrosa by the Montrey Metals Co.

WASHINGTON

Submarine Property in Nighthawk Section Leased—Iron Ore Deposits in Colville Valley To Be Tested

Colville—State geologists are conducting a survey to determine the iron ore possibilities of the Colville Valley. A number of deposits, including hematite and limonite, are known to exist, and plans are being considered by capital with a view to testing the commercial possibilities.

Oroville—A five-year bond has been taken by San Francisco people on the Submarine property, in the Nighthawk section of Okanogan County. The amount involved is $250,000, to be paid in instalments. This ground has been under development by the Southern Minnesota & Washington Mining Co. for some time. Under the provisions of the bond the new owners agree to build a mill and maintain continuous development.

Springdale—Recent shipments from the Queen and Seal mine, of the Deer Tail district, have shown values of about $100 per ton. The property was inactive through litigation until recently.

Chewelah—Returns from crude ore shipments being made by United Silver-Copper mine have been materially increased lately through stoping of a high-grade streak of ore, reported as about 18 in. in width, on the 1,400-ft. level. It is stated that the showing was opened up through a 200-ft. winze sunk from the 1,250-ft. level. Values in silver are reported as ranging from 80 oz. upward.

OREGON

Psyche Property Sold to S. W. Windsor

Baker—The Psyche property, two miles from Greenhorn, which has been under development by J. Dickson for several years, has been sold by him to S. W. Windsor, of Oakland, Cal.

CALIFORNIA

Yuba Company Gets Contract for Three Dredges—Afterthought Sued as Weak Company

Marysville—The Yuba Manufacturing Co. has secured a contract for three large dredges. One is for the La Grange Gold Dredging Co., and will be completed about the first of next year. The other two are for delivery in Idaho and Colorado, and will be completed about June, 1922.

Grass Valley—It is reported that the Eureka-Idaho-Maryland lode was recovered in the Maryland when the water was lowered below the 2,000 level recently.

Sonora — At the Patterson mine a twenty-stamp mill and new office building are being erected under the supervision of J. L. Whitney. It is also planned to install a 150-hp. hoist.

San Francisco—Suit for infringement of patent has been brought against the Afterthought Copper Co. by George C. Carson, as reported briefly last week, the patents involved apparently covering side feeding in reverberatory furnace practice. On Jan. 15, 1907, the plaintiff applied for a patent in which he claims, "In a metallurgical furnace having receptacles arranged above the roof thereof, passages from said receptacles leading to said furnaces are arranged in such manner that the material in said receptacles passes out into said furnace by gravity and forms the lining thereof." The patent was not granted until Aug. 10, 1915 (No. 1,149,495). Just before the application was granted Mr. Carson applied for a "divided" patent, covering the use of water-cooled blocks in the roof for charging ports and the protection of the walls of reverberatory furnaces by feeding the ores and fettling into the furnace through the roof and upper part of the walls.

Mr. Carson's original application for patent antedates the construction of the Inspiration plants and L. D. Rickett's publication of this method of feeding at Cananea.

The Afterthought reverberatory has been operated for only a short time, smelting perhaps 15,000 or 20,000 tons, so it would seem that suit had been brought against it merely because it is a weak company and not liable to make so vigorous defense as a larger one. The case will be tried on Aug. 17.

Colfax—A mining company of which J. Boggs is superintendent has leased the Sim Jordan property, near Iowa Hill, on the North Fork of the American River. It is planned to divert the river from its bed for about a mile by a bedrock tunnel 1,500 ft. long.

Sonora — The Juniper California Mines Co. has given an option to G. L. Holmes, agent, on the Juniper, New Era, Golden Rule, Forquero and Bogan properties for $100,000, payable before July 8, 1924, and 20 per cent of the gross output of gold extracted is to be applied on the purchase price.

NEVADA

Ely—The Boston & Ely Consolidated Mining Co., which recently took over the property of the Ely Northern Co., situated between Ely and Lane City, is developing a body of commercial copper ore 160 ft. in length and 15 ft. wide. The ore is impregnated limonite in contact with monzonite porphyry and the upper and lower limits have not yet been reached. The ore samples 6.3 per cent in copper as mined. All ore taken out will be stored for future treatment.

The recent rich strikes of gold-silver ore in the new Spring Valley district continue to attract prospectors. The greater part of the work now being done in the district is location work on the new discoveries. Development at the Millick mine continues.

MICHIGAN

The Copper Country

Seneca Starts New Drift on 6th Level —Tamarack Reclamation Plant Not To Be Built Now

Houghton—But little copper is moving out of the district. The only metal to be shipped in two weeks was taken out by a boat on Aug. 5. It consisted of 600,000 lb., from the Calumet & Hecla, Copper Range and Quincy smelters. Half of it was C. & H. metal made up of 200,000 lb. of small cakes for a Detroit concern and 100,000 lb. of billets for France.

Calumet & Hecla has no orders on its books at present, but will continue to keep two furnaces in operation. There is still a considerable number of cupola blocks to smelt, and these will be made up into anodes for the electrolytic plant, being returned as cathodes and held in readiness for smelting into such shapes as may be ordered. C. & H. still has a large amount of mass copper and some mineral at the smelter, and this, with the cathodes, will permit filling of orders for special shapes without the necessity of recasting stock shapes. Recent orders have been comparatively small, and it is believed little difficulty will be experienced in handling all business, under present market conditions, with two furnaces.

Calumet & Hecla has stopped exploratory work on the Kearsarge vein encountered by a crosscut from the 81st level of the Red Jacket shaft. It will be taken up again when general operations are resumed. Though no copper ground of unusual character has been opened, the lode is considered worthy of further investigation, even at this great depth.

Seneca has started a drift south on the 6th level toward Ahmeek, to test the ground in that direction. Although it is only a short distance, the copper showing is most encouraging. The north drift continues in excellent ground. All other openings are favorable, including the 4th level stope and the north drifts on the 3d and 5th levels. The 3d level drift, north, proceeding toward Gratiot, is in 1,700 ft. with good values all the way. An electric pump will be installed on the 5th level, replacing air- and steam-driven pumps and centralizing the pumping in the one level.

If the state board of equalization adopts the suggestion of the state tax commission in fixing the equalized values of the counties of the state, the mining companies will pay considerably less in state taxes this year. Although the tax commission has recommended that about two billion dollars be added to the state's equalized valuation, it has recommended that Houghton County's valuation be reduced from $99,000,000 to $90,000,000. If the commission's estimates are adopted, Houghton County's tax rate will be .01343 instead of .02208, as at present.

A decision has been reached not to erect the proposed Tamarack reclamation plant this year. Much of the material is on the ground, but the work will not be started until there is a general recovery in the copper industry.

MINNESOTA

Mesabi Range

Pioneer Mine on Half Time—Shipments Resumed at Northwestern Docks

Ely—The Pioneer mine, of the Oliver Iron Mining Co., has been cut to half time. The Pioneer has long been a steady shipper.

Chisholm—The report of the directors of the Great Northern R.R. states that a quarter interest in the Bruce mine has been leased to the International Harvester Co. The report further states that negotiations were made with the Tyler Iron Mining Co. and the Meade Iron Mining Co. for a lease of the Carmi mine property. The shares held by the Arthur Iron Mining Co. in the Producers' Steamship Co. have been sold to Butlers Brothers, mine contractors and operators.

Owing to the more general curtailment of the Oliver Iron Mining Co., in the Chisholm district, and to the transferring of many of its staff to the Hibbing district, it is anticipated that little work will be done at Chisholm by the company this winter.

Hibbing—The shipments from state-owned mines the week ended Aug. 13 continue to decrease. The tonnage sent forward was 95,096, in comparison to 112,825 tons the previous week. Shipments made in the week mentioned were: Missabe Mountain, 82,957 tons; Leonidas, 1,866; Woodbridge, 3,827; Wanless, 3,209; Philbin, 3,237.

Ashland, Wis.—After a shutdown of many weeks at the Northwestern docks, owing to very light ore shipments, work has been resumed. Five boats loaded in the last week, with cargoes totaling approximately 50,000 tons.

At Port Arthur, Ontario, the two by-laws confirming a fixed assessment for ten years on the blast furnace of the Palatine Mining & Development Co. and the sale of 200 acres of water-front were ratified at a local election.

THE MARKET REPORT

Daily Prices of Metals

Aug.	Copper, N. Y., net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
11	11.75	25.50	26 50	4.40	4.20@4.25	4.20@4.25
12	11.75	25.50	26 25	4.40	4.20@4.25	4.20
13	11.75	25.375	26 25	4.40	4.20@4.25	4.20
15	11.65@11.75	25.375	26.125	4.40	4.20@4.25	4.20
16	11.50@11.75	25.50	26.125	4.40	4.20@4.25	4.20
17	11.50@11.75	25.625	26.125	4.40	4.20@4.25	4.20

*These prices correspond to the following quotations for copper, "delivered": Aug. 11th, 12th, and 13th, 12c.; Aug. 15th, 11.90@12c.; Aug. 16th, 11.85@12c.; Aug. 17th, 11.75@12c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
11	70	70¼	75	157½	158¾	23½	23	25½	26½
12	69¾	70	74½	155¼	156½	23½	23⅜	25½	26⅛
13	...	...	...	...	...	...	...	...	...
15	69⅞	70¼	74	155¼	156½	23⅝	23¼	25½	26⅛
16	69¾	69⅞	73½	154⅞	156	23⅝	23¼	25⅛	25¾
17	68⅛	68⅝	72½	151½	152¼	23⅝	23¼	25	25¼

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Aug.	Sterling Exchange "Checks"	Silver			Aug.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York, Foreign Origin	London
11	365	99¼	60⅞	37½	15	366	99¼	61¼	38
12	366	99¼	60⅞	37½	16	364	99¼	61¼	38
13	365¾	99¼	61	37⅝	17	363¼	99¼	62	38½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon.

Metal Markets

New York, Aug. 17, 1921

With the sole exception of lead, the metal markets have been quiet. Copper and zinc have declined, the drop in copper being partly due to the heavy drop in copper on the London exchange, from £75 last Thursday to £72 10s. today. The importance of the weakness in the London market has been accentuated by the drop in sterling exchange. Tin has also declined in London and New York. Altogether, it has not been a cheering week for metal producers.

Copper

The copper situation at the end of last week appeared brighter than it had been for some time. The market had recovered from a low point, and producers had gotten under the market for the first time in many days. A different complexion has been given it now, however, by the behavior of the London metal market, where prices dropped £2 10s. during the week. Today it is reported that Australian copper was sold for £73 in London, a price equivalent to about 11.80c. c.i.f. or 11.15c. f.a.s. at a refinery on the Atlantic seaboard. Such prices can only result in killing export trade if the market stays at its present level. It is much cheaper, in filling European orders, to ship copper from London to the Continent than to buy it here and ship it abroad directly. Most of the domestic sales were made during the week at a 12c. delivered level. Several September requirements of consumers were filled on this basis. It has not been difficult at any time during the week to obtain copper at this price. Today copper has been offered for 11.75c. delivered, but none has been reported as sold.

Lead

The American Smelting & Refining Co. is continuing its official contract price at 4.40c. The strong position of lead has been maintained throughout the week, and sales have been made at the prices we quote, with but little variation. The volume of sales has been good, and the business again rather well distributed. Consumption is on a sound basis, and producers are in a favorable position to take advantage of any improvement that might take place. Should demand increase only slightly, it would not be surprising to see the market react quickly and prices rise. The strength of lead and its sensitiveness are one of the features of the market. Inquiries are keeping up, and several producers are not disposed to sell lead at present levels, being well caught up on production.

Zinc

There has been little change in the zinc market, which is still in the deplorable state in which it has been for months. The St. Louis zinc and lead markets are almost on a parity, with zinc selling at slightly lower prices. The heavy zinc stocks in the country and the fact that domestic consumption is smaller than production are serious handicaps for the market to overcome. Inquiries are a bit more numerous, but sales are light. It is reported that some zinc has been sold as low as 4.15c., but we have been unable to locate any actual transactions at that level. High-grade zinc is being sold to brass manufacturers at 6c., with freight allowance.

Tin

Owing to the heavy drop in the London market and in sterling exchange, prices of tin have dropped daily. The market is lifeless, and the only encouraging element has been an improved buying from automobile manufacturers who use Chinese tin in the manufacture of alloys entering into the making of their products. Tinplate business is still quiet. Tin is selling for the lowest price in years, and is another one of those metals burdened with heavy surplus stocks. Future tin is selling for same price as prompt.

Arrivals of tin, in long tons: Aug. 9th, Hongkong, 75; 10th, Straits, 450; London, 25; 11th, Rotterdam, 75; Straits, 50; 13th, London, 200; 15th, Straits, 300; Liverpool, 25; Rotterdam, 75; 16th, Rotterdam, 25.

Gold

Gold in London: Aug. 11th, 112s. 5d.; 12th, 112s. 1d; 15th, 112s.; 16th, 112s. 4d.; 17th. 113s. 1d.

General stock of money in the United States, Aug. 1: Gold coin, $3,288,608,408; standard silver dollars, $291,869,326; subsidiary silver, $272,023,798; United States notes, $346,681,016; Federal Reserve notes, $2,920,595,060; Federal Reserve Bank notes, $136,200,400; National Bank notes, $732,419,179; total, $7,988,397,187. Money in circulation per capita, $53. The gold coin increased during July by $65,000,000, and the outstanding notes decreased by about $105,000,000.

Foreign Exchange

Sterling has been somewhat unsettled during the last week, and on Tuesday German marks touched a new low for the year, at slightly under 1.07c. at one time. The future of the mark is decidedly problematical. Paper money is still being printed in Germany in apparently unlimited quantities, and large amounts of it are held speculatively in foreign countries. Cable rates for sterling varied from 0.5 to 1c. above the demand rates quoted on the preceding page. On Tuesday, Aug. 16, francs were 7.725c.; lire, 4.345c.; and marks, 1.115c. New York funds in Montreal, 11⅛ per cent premium.

Silver

For the last week both the London and New York markets have firmed considerably—London rising from 37⅛ to 38⅛d. and New York from 60⅞ to 62c. Indian bazaars and China buying in London and China purchases here are responsible for the advance. The San Francisco market has broadened somewhat, and at the close is steady.

Mexican Dollars—Aug. 11th, 46⅞; 12th, 46⅞; 13th, 46⅞; 15th, 47; 16th, 47; 17th, 47⅛.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

Aluminum—List prices of 24.5@25c. are nominal. Outside market, 19@20c. per lb.; 18½c. for imports, duty paid.

Rogers, Brown & Co., with offices in principal cities, have been appointed sole agents in the United States for the sale of virgin aluminum, of various grades, produced by the Norsk Aluminum Co. of Christiania, Norway. Stocks of aluminum will be carried at New York and Cleveland.

Antimony — Chinese and Japanese brands, 4.60@4.65c.; market dull. W.C.C. brand, 5⅝@5⅞c. per lb. Cookson's "C" grade, spot 9@9½c. Chinese needle antimony, lump, nominal at 4c. per lb. Standard powdered needle antimony (200 mesh), nominal at 6@6½c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 6½@7c.

Bismuth—$1.50@$1.55 per lb., 500-lb. lots.

Cadmium—Range $1@$1.10 per lb., in 1,000-lb. lots. Smaller quantities, $1.10@$1.25 per lb.

Cobalt — Metal, $3@$3.25 per lb.; black oxide, $2.35 per lb. in bbls.

Iridium—Nominal, $160@$170 per oz.

[1]Molybdenum Metal—In rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Standard market, ingot, 41c.; shot, 41c.; electrolytic, 44c. Small tonnages, spot, 35@40c.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—$70@$80 per troy oz. Nominal $70, Los Angeles, Cal.

Palladium—Nominally, $53@$55 per oz.

Platinum—Nominally, $72@$75 per oz.

Quicksilver—Nominally, $43.50@$45 per 75-lb. flask. San Francisco wires $45.75.

[1]Rhodium—$150 per troy oz.

[1]Selenium—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]Thallium Metal—Ingot, 99 per cent pure, $20 per lb.

[1]Tungsten Metal—Wire, $35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Ore analyzing 40@45 per cent Cr_2O_3, crude, $20@$25 per net ton; ground, $30; analyzing 45@50 per cent Cr_2O_3, $30; ground, $35; f.o.b. Atlantic ports. Quotations are nominal.

Iron Ore—Lake Superior ores, per ton, Lower Lake ports: Old Range bessemer, 55 per cent iron, $6.45; Mesabi bessemer, 55 per cent iron, $6.20; Old Range non-bessemer, 51½ per cent iron, $5.70; Mesabi non-bessemer, 51½ per cent iron, $5.55.

Magnetite Ore—F.o.b. Port Henry, N. Y.: Old bed 21 furnace, $4.85; old bed concentrates, 63 per cent, $5.75; Harmony, cobbed, 63 per cent, $5.75; new bed low phosphorus, 65 per cent, $8.50.

Manganese Ore—22c. per unit, seaport; chemical ore (MnO_2) $50@$55 per gross ton, lump; $70@$75 per net ton, powdered. Nominal.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 50c. per lb. in ton lots.

[1]Titanium Ores—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 12c. per lb. for ore, with concessions on large lots or contracts.

Tungsten Ore—Scheelite or wolframite, 60 per cent WO_3 and over, per unit of WO_3, $3@$3.25, f.o.b. Atlantic ports.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Vanadium Ore—$1 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York. Nominal.

[1]Zircon—Washed, iron free, 3c. per lb.

[1]Zirkite—According to conditions, $70@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 13—Zinc blende, per ton, high, $24.10; basis 60 per cent zinc, premium, $21; Prime Western, $21@$20; fines and slimes, $19@$17; average settling price, all grades of blende, $21.78.

Lead, high, $52.30; basis 80 per cent lead, $50; average settling price, all grades of lead, $49.94 per ton.

Shipments for the week: Blende, 5,286; lead, 1,038 tons. Value, all ores the week, $167,000.

Purchases this week exceeded those of last week 2,000 tons of blende, aggregating 5,300 tons, but the larger demand in no manner affected prices. The demand and price of lead ore taxes the mines to supply the quantity sought, and the price, especially compared with zinc, is so enticing that miners are leasing lead ground from owners and operating on their own account. The Childress Leasing Company, composed of miners, has secured permits for operating several abandoned mines for lead.

Platteville, Wis., Aug. 13—No market for zinc or lead ore, and no shipments of ore for the week. The National Zinc Ore Separating Co., at Cuba City, has resumed operations at its roasting and acid plant after two months' shutdown for repairs and improvements.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $1,500@$2,000; No. 2, $850@$1,250; spinning fibers, $350@$850; magnesia and compressed sheet fibers, $225@$350; shingle stock, $95@$150; paper stock, $55@$70; cement stock, $16@$27.50; floats, **$8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada.**

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. South Carolina points. Foreign barytes, prime white material, $25 per net ton, f.o.b. Atlantic seaports. Western grades are $24.50. Crude quoted $7@$10 per long ton, f.o.b. Cartersville, Ga.

Bauxite — French bauxite, $8@$10 per metric ton, c.i.f. Atlantic ports. American bauxite, crushed and dried, $8@$10 per gross ton, f.o.b. shipping points; pulverized and dried, $12@$15 per gross ton, depending upon grade; calcined so as to remove most of the combined water, $20 per gross ton, f.o.b. shipping point.

Borax—Granulated, crystals, or powdered in bags, carloads, 5¼c. per lb.; in bbls., 5½c.

Chalk—English, extra light, 5c. Domestic light, 4½c.; heavy, 4c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $6.50@$8.50; washed, $9@$10; powdered, $13@$20; bags extra, per net ton, f.o.b. mines, Georgia; powdered clay, $13@$20, f.o.b. Virginia points. Imported lump, $12@$20, f.o.b. American ports; powdered, $35@$45, f.o.b. New York.

Emery—Turkish emery, 6@6½c. per lb., depending upon fineness. Inferior grades, 3½c., f.o.b. New England points.

Feldspar—No. 1 soap grade, $7@$7.50 per ton, f.o.b. North Carolina points; No. 1 pottery, $6@$6.50; No. 2, $5@$5.50. Market dull. Large stocks are available and quotations are nominal. Producers report cancellations of orders. No. 1, Canadian, ground, $26 f.o.b. cars.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $20@$22.50 per ton, f.o.b. Illinois and Kentucky mines; acid, glass, and enamel grades, $40@$55; ground, suitable for acid, chemical or enameling purposes, $32@$35; lump, $13.50, f.o.b. Lordsburg, N. M. Ground acid grade, 97 per cent CaF_2, $30, New Mexico.

Fuller's Earth—16 to 30 mesh, $21; 30 to 60 mesh, $23; 60 to 100 mesh, $19; 100 plus mesh, $15, f.o.b. plants, Pennsylvania. California grades, $15@$25, f.o.b. mines. Imported, English, $24@$27, f.o.b. Atlantic ports.

Graphite—Ceylon lump, first quality, 6@7c. per lb.; chip, 4½@5c.; dust, 3@4c. No. 1 flake, 5@6c.; amorphous crude, ¾@2½c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Crushed, New York State shipping points, ¾ in. size, $1.40@$1.75 per net ton; 1½ in., $1.35@$1.70. Prices for other sizes practically the same. Agricultural limestone, $2.50@$4.50 per net ton, f.o.b. eastern shipping points, depending upon analysis.

Magnesite, Calcined — Crude, $12@$15 per ton. High-grade caustic calcined, lump form, $30@$40 per ton. Plastic calcined, $45@$50 in barrels, carload lots, f.o.b. California points. Atlantic seaboard, $60.

Dead-Burned — $33 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $53.80 per ton, f.o.b., Chester, Pa. (Magnesite brick—See Refractories.)

Mica—India block mica, slightly stained, per lb.: No. 6, 35c.; No. 5, $1.20; No. 4, $2.50@$3; No. 3, $3.50@$4; No. 2, $4.50@$6; No. 1, $5.50@$6.50. Clear block: No. 6, 50c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $6.50@$8.50; extra large, $25; ground, wallpaper grade, $90@$160 per ton (depending upon quantity); ground roofing mica, $25@$70, all f.o.b. New York.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $30 per unit, duty paid.

[1]Foote Mineral Co., Philadelphia, Pa.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $11.65; 75 per cent, $10.65; 75@74 per cent, $10.15; 70 per cent, $6.25; 68 per cent, $5.75; 68@66 per cent, $5.50.

Pumice Stone—Imported, lump, 3@40c. per lb.; domestic lump, 5c.; ground, 5@6c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 12c.; Spanish lump, 12@14c.; domestic fines, f.o.b. mines, Georgia, 11@12c.

Silica — Glass sand, $2.25 per ton; sand-blast material, $2.25, both f.o.b. Indiana points. Amorphous or decomposed variety, soft silica, 250 to 500 mesh, $16@$30 per ton. Ganister, crude, $2.50 per ton, f.o.b. Illinois points. Molding sand, building sand, glass sand, $2.25@$3, f.o.b. Pennsylvania points. Market reported dull.

Sulphur—$16@$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines.

Talc—Paper making, $11@$20 per ton; roofing grades, $8.50@$13; rubber grades, $11@$18; all f.o.b. Vermont. California talc, $16@$35, talcum powder grade. Southern talc, powdered, carload lots, $7.50@$11 per ton; less than carload, $25, f.o.b. cars. Imported, $35@$40; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—6c. per lb.

Sodium Nitrate—$2.10@$2.30 per cwt. ex vessel, Atlantic ports.

Sodium Sulphate—For 95 per cent material, $15@$17 per ton, f.o.b. in bulk, Western mines, spot and six months' contract; $22@$25 per ton, New York.

Potassium Sulphate—Powder, domestic, $1.25 per unit, basis 90 per cent, f.o.b. New York.

Ferro-Alloys

Ferrotitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 14c. per lb. of chromium contained; 4 to 6 per cent carbon, 15c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $65@$67, f.o.b. furnace; resale, $90, delivered; English, $65@$70, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $26@$25, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50 per lb. of contained metal, f.o.b. works. Imported material, $1.70@$2.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $40; 50 per cent, $65; 75 per cent, $135.

Ferrotungsten—Domestic, 70 to 80 per cent W, 50@55c. per lb. of contained tungsten, f.o.b. works. Foreign, 50c., duty paid, f.o.b. Atlantic ports.

Ferro-uranium—35 to 50 per cent U, $6 per lb. of U contained, f.o.b. works.

Ferrovanadium—$4.25@$4.50 per lb. of V contained, according to analyses and quantity.

Metal Products

Copper Sheets—Current New York list price, 19¾@20c per lb.; wire, 13½@14c.

Lead Sheets—Full lead sheets, 7¾c.; cut lead sheets, 8c. in quantity, mill lots.

Nickel Silver — 31½c. per lb. for 18 per cent nickel. Grade "A" sheets.

Yellow Metal — Dimension sheets 16¾c.; sheathing, 15½c.; rods, ⅝ to 3 in., 13¾c.

Zinc Sheets—$10 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter.

Refractories

Bauxite Brick—56 per cent alumina, $50 per ton; 76 per cent, $90@$95 f.o.b. works.

Chrome Cement—40@45 per cent Cr_2O_3, $30@$32 per net ton, and $31 in sacks, carload lots, f.o.b. eastern shipping points.

Chrome Brick—$55 per net ton.

Fire Brick—First quality, 9-in. shapes, $35@$40 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $30@$35.

Magnesite Brick—9-in. straights, $70@$75 per net ton; 9-in. arches, wedges and keys, $77; soaps and splits, $98, f.o.b. works.

Silica Brick—9-in., per 1,000: $35@$45 in carload lots, f.o.b. shipping points.

The Iron Trade

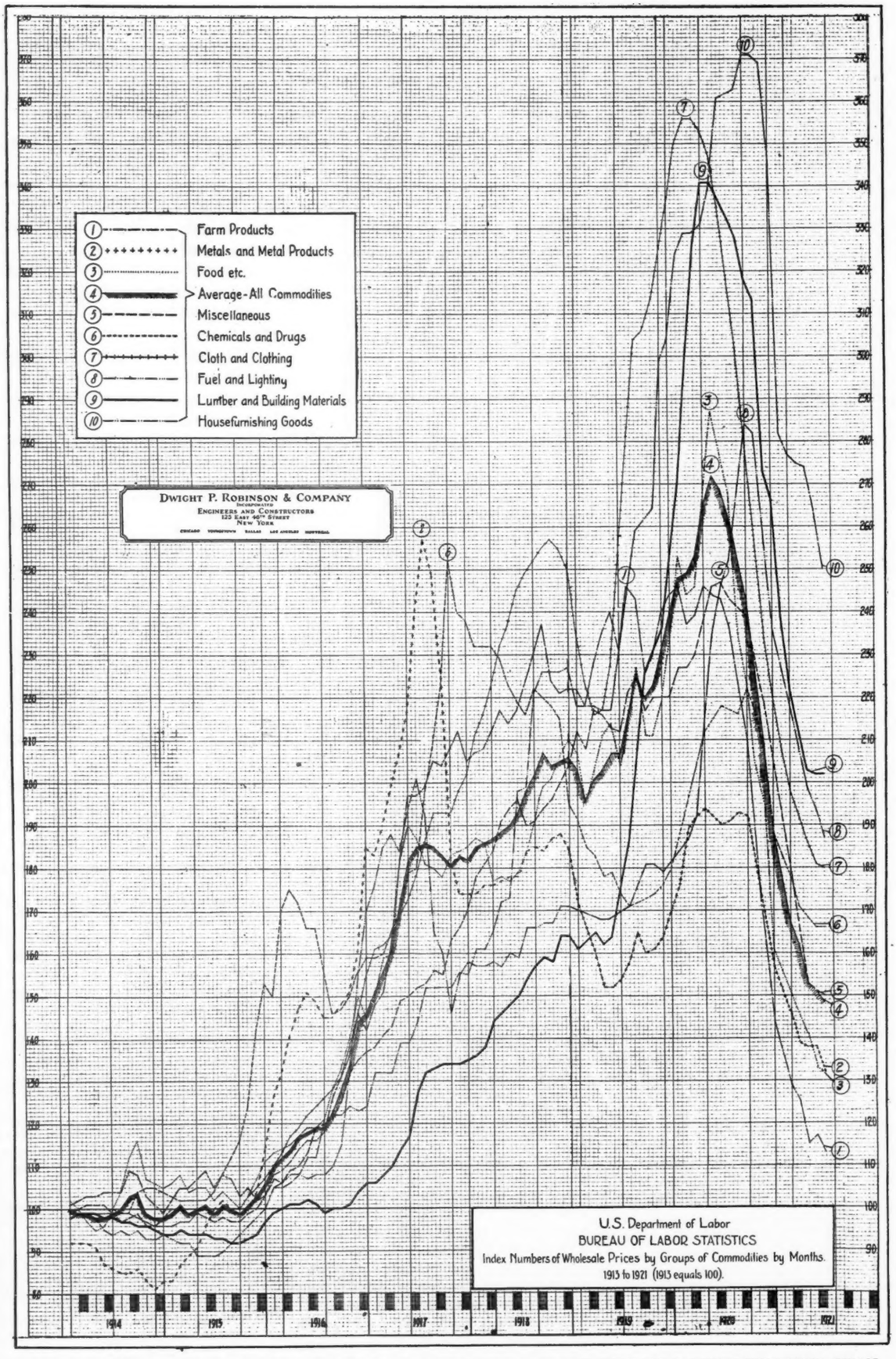
Pittsburgh, Aug. 16, 1921

With the American Iron and Steel Institute's report of the production of thirty steel companies as a basis, it may be estimated that the industry produced steel ingots in July at the average of about 21 per cent of capacity, with a dip at the middle of the month to a rate of 18 or 19 per cent. The July rate was about 11,000,000 gross tons per annum. Production now is at nearly if not quite 25 per cent of capacity. Steel prices not only are not definitely declining but are showing considerable measure of steadiness. In most cases carload business goes at the full quoted prices. Sheets continue to lead the finished steel market in point of activity, and production averages 35 per cent or more of capacity. The July decrease of 287,544 tons in the Steel Corporation's unfilled obligations was the smallest decrease for months.

Pig Iron—The market shows distinct signs of growing steadier. The Valley market remains at $20 for bessemer, $18 for basic and $19.50 for foundry. A near-by producer has sold 500 tons of bessemer at $21.44, delivered Pittsburgh.

Coke

Connellsville — Furnace, $2.75@$3; foundry, $4@$4.50.



NOTE IN THESE PRICE CURVES HOW RAW-MATERIAL PRICES HAVE DECLINED MUCH FURTHER THAN THOSE OF MANUFACTURED PRODUCTS

COMPANY REPORTS

Round Mountain Mining Co.

Gold; Nevada

A report of operations of the Round Mountain Mining Co. for the year 1920 states that 64,665 cu.yd. of placer gravel was hydraulicked, yielding 4,292.26 oz. of bullion, having a value of $56,277.37. In addition, $818.78 was received as royalties from placer leases. The total operating costs were $44,631.11 and the net realization was $11,646.26. A table showing the production and percentage of the clean-up from hydraulicking and bedrock cleaning is presented at the bottom of this page.

During the period beginning Jan. 1, 1920, and ending June 30, 1920, mining and milling operations at lode mines were carried on, in which time 4,513.1 tons of ore, having a gross value of $23,475.29, was mined and milled. The bullion produced yielded $21,377.96, representing an extraction of 91 per cent. The gross value per ton was $5.1992; tailings $0.4644; net value per ton $4.7348. The total development, stoping, milling, and marketing cost was $35,316.12, or $7.822 per ton; of which $17,006.50, or $3.767 per ton, was for development; $9,372.09, or $2.0076 per ton, for stoping; $8,556.58, or $1.895 per ton, for milling, and $380.24, or $0.084 per ton, for marketing.

In 1920, the lessees of the Round Mountain Mining Co. mined and milled 1,278.5 tons of ore, having a net value of $67,351.89, or $52.68 per ton. The company received in royalties from these operations $15,340.63, or $11.999 per ton. To this should be added the milling charge of $1 per ton, making the total revenue of the company from the lessees, $16,619.13.

The operating account, showing revenues, costs, and mine production, follows:

		Per Yard
Revenues:		
Placer bullion sales (64,665 yd.)	$56,277.37	$0.8703
Placer leases royalties	818.78	
Lode leases royalties	15,340.63	
Lode bullion sales (4,513 tons)	21,377.96	
Dividends (Fairview Round Mountain Mines Co.)	6,000.00	
Miscellaneous earnings	7,108.00	
Total Revenues:	$106,922.74	
Costs:		
Development	17,006.50	
Stoping	9,372.09	
Milling	8,556.58	
Marketing (lode), bullion	380.95	
Total development, stoping, milling and marketing	$35,316.12	
Total general	42,908.29	
Placer operating costs (64,665 cu.yd.):		
Development	482.76	0.0074
Hydraulicking	37,287.75	0.5766
Bedrock cleaning	3,252.12	0.0503
General placer expense	4.45	0.0001
Placer residence expense	10.00	0.0002
Placer leasing expense	5.12	0.0001
Total	$41,042.20	$0.6347
Placer maintenance	3,066.50	$0.0474
Marketing placer bullion	522.41	$0.0080
Total placer operating costs	44,631.11	$0.6901
Total lode and placer operating costs	$122,855.52	
Net operating deficit	$15,932.78	
Depreciation charges	$40,028.54	
Depletion charges:		
Lode	$356.15	
Placer	14,961.54	
Total depletion	$15,317.69	

Pit	Hydraulicking Yards	Hydraulicking Value	Hydraulicking Per Yard	Bedrock Cleaning Value	Bedrock Cleaning Per Yard	Final Clean-up Value	Final Clean-up Per Yard	Total Value	Total Per Yard
"E"	7,780	$2,696.13	$0.347	$4,971.19	$0.639	$594.00	$0.76	$8,261.32	$1.062
"F"	22,475	11,545.78	.514	2,205.87	.098	2,539.00	.112	16,290.65	.724
"M"	34,410	25,992.61	.755	No bedrock cleaned	.....	5,732.79	.166	31,725.40	.922
Total	64,665	$40,234.52	.622	$7,177.06	.111	$8,865.79	.137	$56,277.37	.870

Shattuck Arizona Copper Co.

The results of operations of the Shattuck Arizona Copper Co. for the quarter ended June 30, 1921, were as follows: The total development work for the quarter was 3,265 ft. There was no regular production during the quarter. However, 1,074 dry tons of development ore was shipped and smelted which averaged about 7 per cent copper, 5 oz. in silver, and 40c. in gold per ton. The total production from this ore was as follows:

Pounds of copper recovered	152,578
Ounces of silver recovered	5,397
Ounces of gold recovered	22.34

About 500 tons of development ore was left in the mine bins on June 30, 1921. Only development work was done during the second quarter, as in the first three months of this year. The expense was as follows:

Development expense		$90,264.02
Administrative expense and taxes		4,662.70
		$94,926.72
Net development returns	$18,488.13	
Interest	12,386.23	30,874.36
Net expense for quarter		$64,052.36

The net development returns were obtained by inventorying recovered copper at 13c. per lb. and deducting all costs beyond the mine. Net development expense since Jan. 1 will be carried as a deferred charge and distributed over future production of copper.

Central Mining and Investment Corporation

Gold; South Africa

A report of operations of the Central Mining and Investment Corporation, Ltd., for the year 1920 shows the following results:

MINES UNDER CENTRAL MINING ADMINISTRATION

	1919	Per Ton Milled	1920	Per Ton Milled
Tonnage milled	10,587,638	.....	11,327,312	.....
Revenue from gold won (at standard price)	£15,793,343	29.83/–	£15,879,251	28.04/–
Working expenditure	12,809,520	24.19/–	14,911,835	26.33/–
Working profit (exclusive of premium)	2,983,823	5.64/–	967,416	1.71/–
Additional revenue from sales of gold above standard price	1,616,254	3.06/–	4,913,764	8.67/–
Total revenue	17,409,596	32.89/–	20,793,015	36.71/–
Working profit (inclusive of premium)	4,600,076	8.70/–	5,881,180	10.38/–
Dividends declared	3,128,142	5.91/–	4,280,336	7.56/–

The accounts show a profit of £390,283 11s. 5d., to which has to be added the net amount brought forward from Dec. 31, 1919, £145,259 3s. 4d., making a total of £535,542 14s. 9d. This amount is appropriated to respective accounts as follows:

Interim dividend of 6s. per share, free of income tax, paid in Dec. 1920	£127,500 0 0	
Final dividend of 6s. per share, free of income tax	127,500 0 0	
		£255,000 0 0
Transfer to reserve		100,000 0 0
Provision for income tax		70,000 0 0
Additional remuneration due to the directors		10,146 5 4
Leaving a balance to be carried forward of		100,396 9 5
		£535,542 14 9

The capital of the corporation remains unchanged at £3,400,000, divided into 425,000 shares of £8 each. The reserve fund now stands at £750,000.

MINING STOCKS

Week Ended August 13, 1921

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Ahmeek	Boston	48	46	46	Sept. '20, Q	$0.50
Alaska-Br. Col.	N. Y. Curb	*35	*32	*34		
Allouez	Boston	19	18	18	Mar. '19	1.00
Anaconda	New York	35⅞	34½	35	Nov. '20, Q	1.00
Arcadian Consol.	Boston	2	1½	1½		
Ariz. Com'l	Boston	7⅛	7⅛	7⅛	Oct. '18, Q	.50
Big Ledge	N. Y. Curb	*24	*22	*22		
Bingham Mines	Boston	†10	†9½	....	Sept. '19, Q	.25
Calumet & Arizona	Boston	47	45½	45½	June '21, Q	.50
Calumet & Hecla	Boston	222	219½	222	June '20, Q	5.00
Canada Copper	N. Y. Curb	*35	*28	*28		
Centennial	Boston	†10½	†7½	7⅝	Dec. '18, SA	1.00
Cerro de Pasco	New York	25	24½	25	Mar. '21, Q	.50
Chile Copper	New York	10¼	9⅞	10		
Chino	New York	23	22	22½	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*27½	*27	*27		
Con. Arizona	N. Y. Curb	....	....	*3	Dec. '18, Q	.05
Con. Copper Mines	N. Y. Curb	1⅛	1	1		
Copper Range	Boston	31	30½	30½	Sept, '20, Q	.50
Crystal Copper	Boston Curb	*40	*37	*40		
Davis-Daly	Boston	6½	5½	6½	Mar. '20, Q	.25
East Butte	Boston	8	7¼	7¼	Dec. '19, A	.50
First National	Boston Curb	*52	*50	*50	Feb. '19, SA	.15
Franklin	Boston	1¾	1⅛	1⅛		
Gadsden Copper	N. Y. Curb	....	....	*25		
Granby Consol.	New York	16½	16	16	May '19, Q	1.25
Greene-Cananea	New York	21⅜	20⅜	21	Nov. '20, Q	.50
Hancock	Boston	†3	†2½	2½		
Howe Sound	N. Y. Curb	2½	2¼	2¼	Jan. '21, Q	.05
Inspiration Consol.	New York	32⅛	31	31⅛	Oct. '20, Q	1.00
Iron Cap	Boston Curb	....	....	5½	Sept. '20, K	.25
Isle Royale	Boston	19	17	17	Sept. '19, SA	.50
Kennecott	New York	18½	17⅞	18⅛	Dec. '20, Q	.50
Keweenaw	Boston	1½	1½	1½		
Lake Copper	Boston	†3	†2½	2½		
La Salle	Boston	1½	1¼	1¼		
Magma Chief	N. Y. Curb	....	....	*8		
Magma Copper	N. Y. Curb	18	17	17⅜	Jan. '19, Q	.50
Majestic	Boston Curb	*6	*5	*5		
Mason Valley	Boston	1¼	1¼	1¼		
Mass Consolidated	Boston	1½	1⅜	1⅜	Nov. '17, Q	1.00
Miami Copper	New York	20⅜	19⅛	20	May '21, Q	.50
Michigan	Boston	†2	†1½	1½		
Mohawk	Boston	48	46½	47	Nov. '20, Q	1.00
Mother Lode Coa.	N. Y. Curb	4	3½	4		
Nevada Consol.	New York	10	9⅞	9⅞	Sept. '20, Q	.25
New Baltic	Boston Curb	....	....	3		
New Cornelia	Boston	13½	12½	12½	Aug. '20, K	.25
North Butte	Boston	9¼	7⅞	9	Oct. '18, Q	.25
North Lake	Boston	*15	*15	*15		
Ohio Copper	N. Y. Curb	....	....	*12		
Old Dominion	Boston	22	22	22	Dec. '18, Q	1.00
Osceola	Boston	22	21	22	June '20, Q	.50
Phelps Dodge	Open Mar.	†155	†145	....	July '21, Q	1.00
Quincy	Boston	35	34½	34⅝	Mar. '20, Q	1.00
Ray Consolidated	New York	12½	12	12	Dec. '20, Q	.25
Ray Hercules	N. Y. Curb	*29	*21	*21		
St. Mary's Min. Ld.	Boston	31	30	30	June '20, K	2.00
Seneca Copper	Boston	15½	15½	15⅝		
Shannon	Boston	*85	*80	*85	Nov. '17, Q	.25
Shattuck Arizona	New York	6½	6¼	6½	Jan. '20, Q	.25
South Lake	Boston	*62	*62	*62		
Superior Copper	Boston	2⅜	2⅛	2⅛	Apr. '17,	1.00
Superior & Boston	Boston	1¼	1⅛	1⅛		
Tenn. C. & C. cfs	New York	7⅜	7⅛	7⅛	May '18, I	1.00
Tuolumne	Boston	*46	*40	*44	May '13,	.10
United Verde Ex.	Boston Curb	23	22⅛	22⅛	May '21, Q	.25
Utah Consol.	Boston	†4	†3½	3½	Sept. '18,	.25
Utah Copper	New York	47	44⅜	44⅜	June '21, Q	.50
Utah Metal & T.	Boston	1⅜	1⅛	1⅛	Dec. '17,	.30
Victoria	Boston	1⅛	1⅛	1⅛		
Winona	Boston	†*50	†*45	....		
Wolverine	Boston	10½	10½	10½		
NICKEL-COPPER						
Internat. Nickel	New York	13½	13	13¼	Mar. '19,	.50
Internat. Nickel, pf.	New York	....	....	84	Aug. '21, Q	1.50
LEAD						
National Lead	New York	75	72	72	June '21, Q	1.50
National Lead, pfd.	New York	....	....	103	June '21, Q	1.75
St. Joseph Lead	New York	11	11	11	June '21, Q	.25
QUICKSILVER						
New Idria	Boston	†*50	....	*50		
ZINC						
Am. Z. L. & S.	New York	8	7⅞	7⅞	May '20,	1.00
Am. Z. L. & S, pfd.	New York	....	....	25	Nov. '20, Q	1.50
Butte C. & Z.	New York	4½	4½	4½	June '18,	.50
Butte & Superior	New York	12⅜	11⅜	12	Sept. '20,	1.25
Callahan Zn-Ld.	New York	4⅜	4⅜	4⅜	Dec. '20, Q	.50
New Jersey Zn.	N. Y. Curb	....	....	116⅜	Aug. '21, Q	2.00
Success	N. Y. Curb	....	....	*2	July '16,	.03
Yellow Pine	Los Angeles	‡....	....	*55	Sept. '20, Q	.03

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.

Toronto quotations courtesy Hamilton B. Wills; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Commerce and Oil; Colorado Springs, The Financial Press, N. Y.

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	New York	½	½	½		
Alaska Juneau	New York	1⅝	1⅝	1⅝		
Carson Hill	Boston	12⅞	12	12⅛		
Cresson Consol. G.	N. Y. Curb	1¼	1¼	1¼	June '20, Q	$0.10
Dome Extension	Toronto	†*65	†*64	*65		
Dome Mines	New York	17	16½	16⅝	July '21, Q	.25
Florence Goldfield	N.Y. Curb	*43	*39	*40		
Golden Cycle	Colo. Springs	*65	*64½	*64½	June '21 Q	.02
Goldfield Consol.	N. Y. Curb	*7	*5	*6	Dec. '19,	.05
Hollinger Consol.	Toronto	7.12	7.10	7.10	Aug. '21 4 wks.	.05
Homestake Mining	New York	58	57½	57½	July '21 M	.25
Kirkland Lake	Toronto	†*40	†*37½	*37		
Lake Shore	Toronto	1.24	1.21	1.21	Aug. '21, K	.02
McIntyre-Porcupine	Toronto	1.99	1.94	1.95	May '21, K	.05
Porcupine Crown	Toronto	*14	*14	*14	July '17,	.03
Portland	Colo. Springs	*43	*43	*43	Oct. '20, Q	.01
Reorgan. Booth	N. Y. Curb	....	....	*4	May '19,	.05
Silver Pick	N. Y. Curb	*12	*11	*12		
Teck Hughes	Toronto	*15½	*15	*15½		
Tom Reed	Los Angeles	‡....	....	*71	Dec. '19,	.02
United Eastern	N. Y. Curb	2 1/16	2 1/16	2 1/16	July '21, Q	.15
Vindicator Consol.	Colo. Springs	*29	*27½	*27½	Jan. '20, Q	.01
West Dome Consol.	Toronto	*7½	*7½	*7½		
White Caps Mining	N. Y. Curb	*6	*5	*5		
Yukon Gold	N. Y. Curb	*90	*76	*80	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*22	*18	*21	Apr. '20, M	.03
Batopilas Mining	New York	½	½	½	Dec. '07, I	.12½
Beaver Consol.	Toronto	*26	*26	*26	May '20, K	.03
Coniagas	Toronto	1.65	1.65	1.65	May '21, Q	.12½
Crown Reserve	Toronto	†*10	†*7	*9	Jan. '17,	.05
Kerr Lake	N. Y. Curb	3⅞	3⅜	3⅜	July '21, Q	.12½
La Rose	Toronto	*22	*18½	*18½	Apr. '18,	.02
McKinley-Dar.-Sav.	Toronto	*15	*15	*15	Oct. '20, Q	.03
Mining Corp. Can.	Toronto	1.25	1.15	1.25	Sept. '20, Q	.12½
Nipissing	N. Y. Curb	4⅜	4¼	4½	July '21, Q	.15
Ontario Silver	New York	....	....	3½	Jan. '19, Q	.50
Ophir Silver	San Francisco	....	....	*9	Jan. '12,	.10
Peterson Lake	Toronto	†*5	†*4½	....	Jan. '17,	.01¾
Temiskaming	Toronto	....	†*22	....	Jan. '20, K	.04
Trethewey	Toronto	†*15	†*12	....	Jan. '19,	.05
GOLD AND SILVER						
Barnes-King	Butte	‡....	....	*60	Aug. '20, Q	.05
Boston & Montana	N. Y. Curb	*74	*65	*70		
Cash Boy	N. Y. Curb	*7	*5	*6		
Consol. Virginia	San Francisco	....	....	*16		
Dolores Esperanza	N. Y. Curb	2	2	2		
El Salvador	N. Y. Curb	*21	*16	*17		
Jim Butler	N. Y. Curb	*8	*7½	*7½	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*5	*4	*4	June '16,	.05
Louisiana Con.	N. Y. Curb	....	....	½		
MacNamara M.& M.	N. Y. Curb	*18	*16	*16	May '10,	.02½
N. Y. Hond. Rosar.	Open Mar.	....	....	4	Jan. '21, Q	.30
Tonopah-Belmont	N. Y. Curb	1⅜	1 1/16	1 1/16	Apr. '21, Q	.05
Tonopah-Divide	N. Y. Curb	*84	*71	*75		
Tonopah-Extension	N. Y. Curb	1½	1½	1½	July '21, Q	.05
Tonopah Mining	N. Y. Curb	1 1/16	1 1/16	1 1/16	Apr. '21, SA	.05
West End Consol.	N. Y. Curb	*81	*65	*77	Dec. '19, SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*10	*8	*10	Jan. '21, M	.01
Cardiff M. & M.	Salt Lake	†1.20	†1.10	1.20	Dec. '21,	.15
Chief Consol.	Boston Curb	2⅛	2⅛	2⅛	Aug. '21, Q	.05
Consol. M. & S.	Montreal	15	15	15	Oct. '20, Q	.62½
Daly Mining	Salt Lake	‡....	....	....	July '20, Q	.10
Daly-West	Boston	†3	†2½	2½	Dec. '20, Q	.25
Eagle & Blue Bell	Boston Curb	....	....	2	Apr. '21, K	.05
Electric Point	Spokane	‡....	....	*5	May '20, SA	.03
Eureka-Croesus	N. Y. Curb	*44	*32	*35		
Federal M. & S.	New York	....	....	7	Jan. '09,	1.50
Federal M. & S., pfd	New York	22	22	22	June '21, Q	1.00
Florence Silver	Spokane	‡....	....	*11	Apr. '19,	.01½
Grand Central	Salt Lake	‡....	....	....	June '20, K	.03
Hecla Mining	N. Y. Curb	4 1/16	3⅞	4	June '21, Q	.08
Iron Blossom Con.	N. Y. Curb	*17	*17	*17	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	†3.50	†2.00	....	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*3	*3	*3	June '21, I	.02
Prince Consol.	Salt Lake	†*21½	†*20	....	Nov. '17,	.02½
Rambler-Cariboo	Spokane	‡....	....	3½	Feb. '19,	.01
Rex Consol.	N. Y. Curb	*9	*7	*8		
South Hecla	Salt Lake	*35	*20½	*20½	Sept. '19, K	.15
Standard Silver-Ld.	N. Y. Curb	*12	*10	*10	Oct. '17,	.05
Stewart Mining	N. Y. Curb	*4	*3	*3	Dec. '15	.05
Tamarack-Custer	Spokane	‡....	....	1.80	Jan. '21 K	.04
Tintic Standard	Salt Lake	2.40	2.22½	2.22½	July '21, Q	.05
Utah Apex	Boston	1⅛	1⅛	1⅛	Nov. '20, K	.25
Wilbert Mining	N. Y. Curb	*3	*2	*2	Nov. '17,	.01
VANADIUM						
Vanadium Corp.	New York	29½	27½	27⅝	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp.	Montreal	47	46	47	July '21, Q	1.50
Asbestos Corp., pfd.	Montreal	73½	73½	73½	July '21, Q	1.75
MINING, SMELTING AND REFINING						
Amer. Sm. & Ref.	New York	35⅞	33¼	34⅛	Mar. '21, Q	1.00
Amer. Sm. & Ref. pf	New York	72	71¼	71½	June '21, Q	1.75
Am. Sm. pf. A	New York	....	....	67½	July '21, Q	1.50
U. S. Sm. R. & M.	Boston	30	29	29	Jan. '21, Q	.50
U.S.Sm.R.& M. pf.	Boston	38	37½	37½	July. '21, Q	.87½